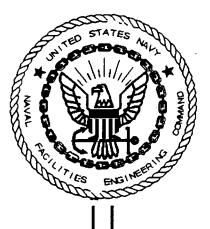


ASSEMBLY C CSI REPORT NAVAL SUPPORT ACTIVITY MEMPHIS MILLINGTON, TENNESSEE



SWMUs 26, 27, AND 62

REVISION 2

CTO-094

Contract No: N62467-89-D-0318

Prepared for:

Department of the Navy Southern Division Naval Facilities Engineering Command North Charleston, South Carolina



Prepared by:

EnSafe/Allen & Hoshall 5720 Summer Trees Drive, Suite 8 Memphis, Tennessee 38134 (901) 383-9115

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ASSEMBLY C CSI REPORT NAVAL SUPPORT ACTIVITY MEMPHIS MILLINGTON, TENNESSEE

RCRA FACILITY INVESTIGATION SWMU 26 — N-102 BATTERY ACID NEUTRALIZATION UNIT



REVISION 2

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LIST OF ACRONYMS AND ABBREVIATIONS

BRAC Base Realignment and Closure

bls below land surface cm/sec centimeters per second

CSI Confirmatory Sampling Investigation

DQO Data Quality Objective E/A&H EnSafe/Allen & Hoshall

HI Hazard Index

ILCR Incremental Lifetime Excess Cancer Risk

 $\mu g/L$ micrograms per liter mg/kg milligrams per kilogram

ND not detected

NET National Environmental Testing, Incorporated

NSA Naval Support Activity (formerly Naval Air Station)

PCBs polychlorinated biphenyls
PRE Preliminary Risk Evaluation
RBC risk-based concentration

RCRA Resource Conservation and Recovery Act

RFI RCRA Facility Investigation

RR risk ratio

SIP Site Investigation Plan

SOUTHNAVFACENGCOM Southern Division Naval Facilities Engineering Command

SSL soil screening level

SVOC semivolatile organic compound SWMU solid waste management unit

THQ target hazard quotient

TR target risk

USGS U.S. Geological Survey

EXECUTIVE SUMMARY

The Assembly C Site Investigation Plans for Naval Support Activity Memphis proposed two phases of investigation for a Confirmatory Sampling Investigation (CSI) at Solid Waste Management Unit (SWMU) 26, the Building N-102 Battery Acid Neutralization Unit. The first phase consisted of a subsurface soil sampling investigation using Geoprobe equipment. Based on the results of the first phase, the second phase, consisting of installing and sampling soil borings and monitoring wells, is not required. This report summarizes the activities conducted during the CSI's first phase and resulting findings and conclusions.

During the first phase of the SWMU 26 CSI, subsurface soil samples collected from three intervals at four sample stations were analyzed for six metals (arsenic, cadmium, lead, mercury, nickel, and zinc.) Detected concentrations of metals were less than two times the background reference concentration (two times the mean background concentration) and/or United States Environmental Protection Agency soil screening levels.

To finalize the Resource Conservation and Recovery Act closure of the SWMU, one surface soil sample was collected immediately adjacent to the neutralization unit and analyzed for semivolatile organic compounds, pesticides/polychlorinated biphenyls, and Appendix IX metals. These sample results were used to prepare a Preliminary Risk Evaluation (PRE), which indicated the property is suitable for lease for either commercial or residential land use.

Based on the results of the first phase, no further action is recommended for SWMU 26.

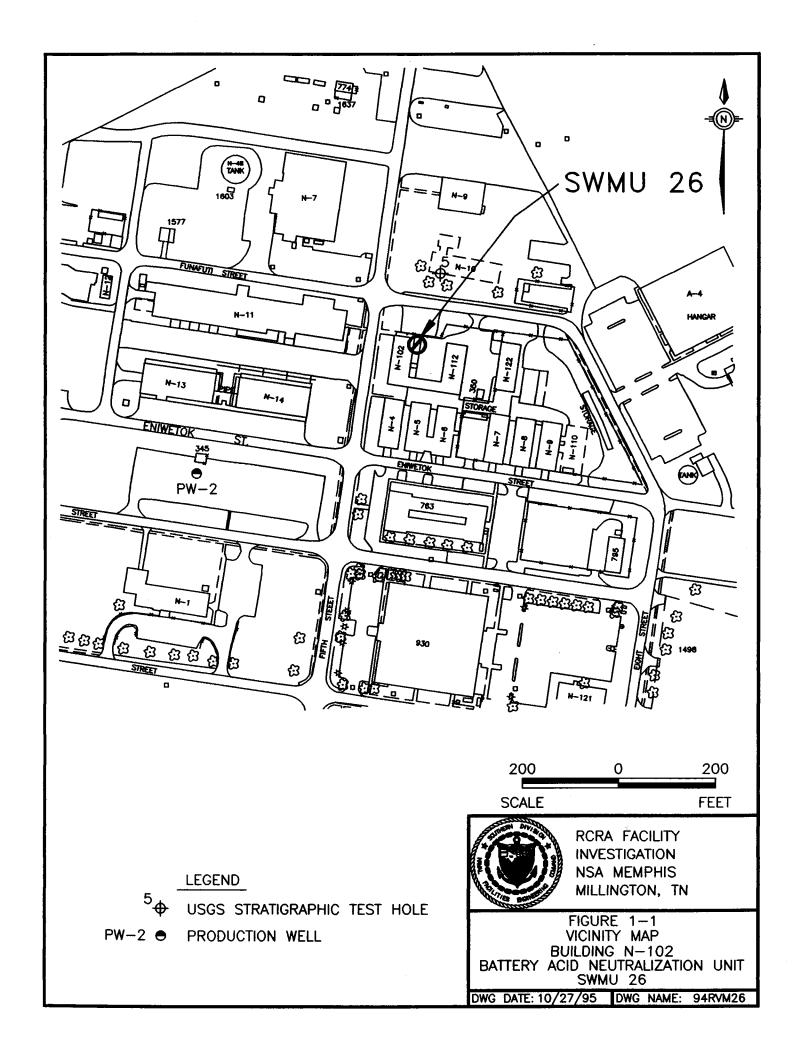
1.0 INTRODUCTION

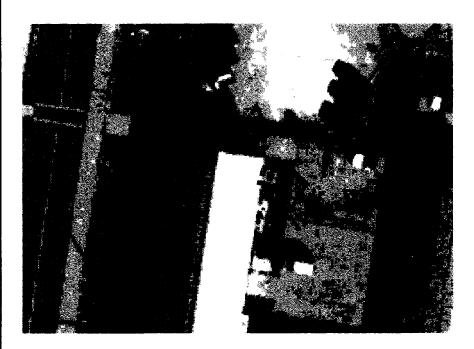
As part of the U.S. Navy Installation Restoration Program, the following Confirmatory Sampling Investigation (CSI) report has been prepared for Solid Waste Management Unit (SWMU) 26, the N-102 Battery Acid Neutralization Unit, on the Northside of Naval Support Activity (NSA) Memphis, Millington, Tennessee. Figures 1-1 and 1-2 provide a vicinity map and aerial photograph of SWMU 26, respectively.

As a result of the Base Closure and Realignment Act of 1990 (BRAC), a portion of NSA Memphis, which includes SWMU 26, will be closed and prepared for transfer to the City of Millington. Eight SWMU assemblies (i.e., groups) have been defined for the NSA Memphis Resource Conservation and Recovery Act (RCRA) Corrective Action Program. Four of these assemblies (A, B, C, and D) are on closing portions of the base and have been categorized and ranked according to their BRAC status. SWMU 26 is in Assembly C, which is composed of five SWMUs requiring CSIs to confirm whether a release of contaminants has occurred and, if so, whether RCRA Facility Investigation (RFI) characterization will be required. The remaining four assemblies (E, F, G, and H) are on portions of the base that will remain open. The investigation, undertaken by EnSafe/Allen & Hoshall (E/A&H), adhered to the requirements of the Hazardous and Solid Waste Amendments portion (HSWA-TN002) of RCRA Permit No. TN2-170-022-600 and applicable regulations.

The Assembly C Site Investigation Plans (E/A&H, 1995) proposed two phases of investigation for the SWMU 26 CSI. The first phase consisted of a subsurface soil investigation using truck-mounted Geoprobe equipment to collect the samples. Based on the results of the first phase, a second phase, consisting of installing soil borings and monitoring wells, is not required. In addition, one surface-soil sample was collected and analyzed, and the results were used to prepare a Preliminary Risk Evaluation (PRE). The PRE indicates the property is suitable for lease for either residential or commercial land use.

This CSI report summarizes the activities conducted during the investigation's first phase and provides conclusions, including a recommendation for no further action.





SWMU 26 BOUNDARY

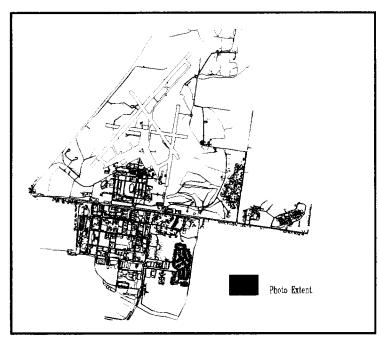




Photograph Scale

50

100 Ft.





RCRA FACILITY INVESTIGATION NSA MEMPHIS MILLINGTON, TENNESSEE

FIGURE 1-2
DIGITAL ORTHOPHOTOGRAPH
N-102 BATTERY ACID NEUTRALIZATION UNIT
SWMU 26

AML horsel/sel/steve/slin_di

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2.0 SITE DESCRIPTION AND HISTORICAL INFORMATION

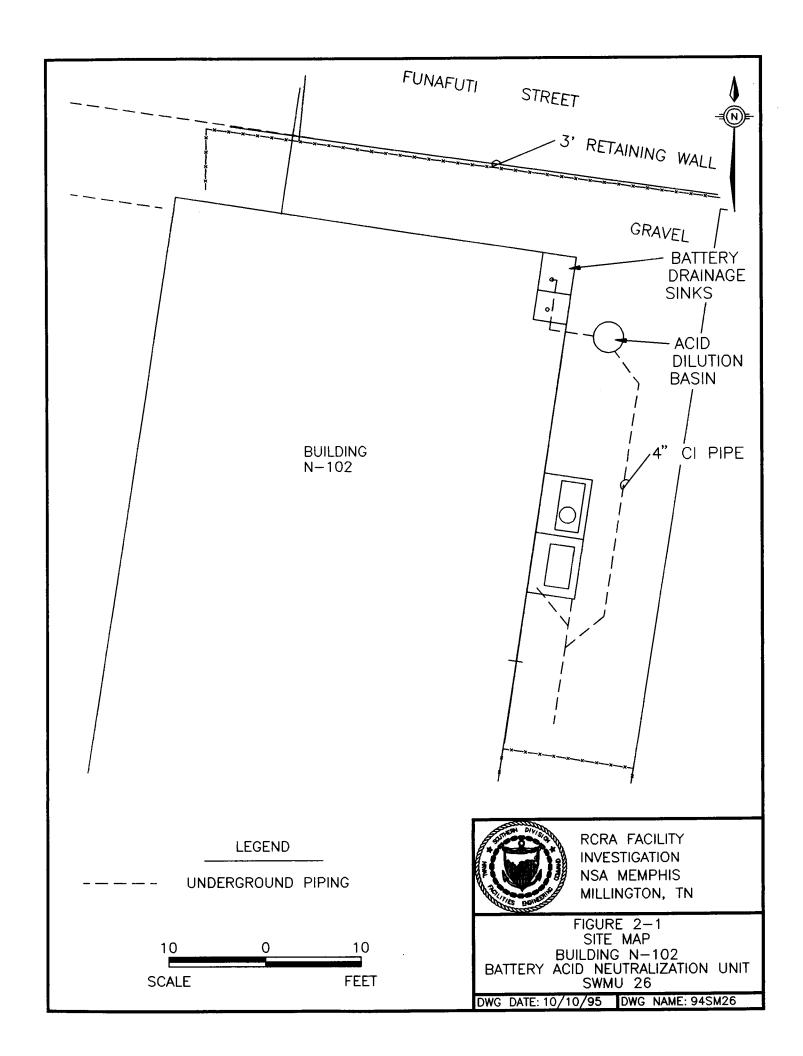
2.1 Site Description

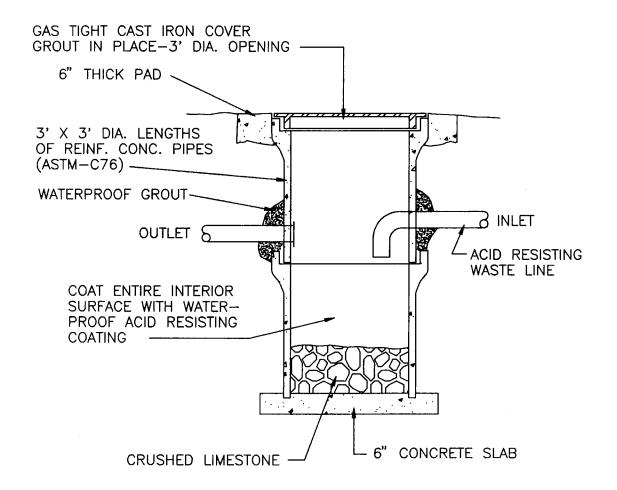
SWMU 26 is the site of an inactive, subsurface acid neutralization unit that was installed in 1980 and used in conjunction with the Building N-102 Battery Shop, adjacent and immediately southwest of the SWMU. Building N-102 is on the southeast corner of Funafuti Street and Fifth Avenue on the Northside of NSA Memphis. Figure 2-1 provides a site map of SWMU 26.

The neutralization unit is in a grassy area between Building N-102 and a sidewalk which runs along the length of the building. The area between Building N-102 and the adjacent Building N-122 to the east is elevated and paved, with a retaining wall facing Funafuti Street to the north. The street is approximately 3 feet below the paved area. The neutralization unit, covered by a 6-inch thick concrete pad and a 3-foot diameter manhole on the surface, is constructed of two 3-foot long by 3-foot diameter reinforced concrete pipes set in a 6-inch thick concrete base pad. The site drains to the southwest into the SWMU 4 storm sewer and drainage ditch, which is approximately 1,000 feet south of SWMU 26 at its closest point. Water in SWMU 4 eventually empties into the North Fork Creek.

2.2 Historical Site Operations

The N-102 Battery Acid Neutralization Unit received drainage from a pair of lead sinks along the inside wall of the northeast corner of Building N-102. It was designed to neutralize drained battery acid and flush water prior to discharge into the sanitary sewer system. During its operation, the unit was pumped, and its crushed limestone (sodium carbonate) was replenished every six months to maintain the system's effectiveness. Figure 2-2 provides a construction schematic of the neutralization unit. The neutralization unit was bypassed in 1992, when the Naval Environmental Inspection Team indicated that it might qualify as a potential hazardous waste site.





SECTION SCALE: NOT TO SCALE



RCRA FACILITY INVESTIGATION NSA MEMPHIS MILLINGTON, TN

FIGURE 2-2 CONSTRUCTION DETAILS BUILDING N-102 BATTERY ACID NEUTRALIZATION UNIT SWMU 26

DWG DATE: 05/22/96 DWG NAME: 94CD26

3.0 PRELIMINARY INVESTIGATIONS

No adverse conditions were identified in a Visual Site Inspection of the unit conducted in 1990 (ERC/EDGe, 1990). The neutralization unit was bypassed in 1992 when the Naval Environmental Inspection Team indicated that it might qualify as a potential hazardous waste site. A sample collected from its contents (liquid/solid) on June 29, 1992, was analyzed for Toxicity Characteristic Leaching Procedure metals, base-neutral/acid extractable organic compounds, and volatile organic compounds. Results of the analyses indicate constituent concentrations within the tank were below regulatory levels for disposal as a hazardous waste. Appendix A contains a copy of the analytical report.

4.0 FIELD INVESTIGATIONS AND METHODOLOGY

The CSI soil and groundwater sampling program was intended to confirm the absence or presence of contaminants associated with past activities at SWMU 26. Specifically, the CSI objectives were:

- Determine the status and impact of the acid neutralization unit.
- Determine the potential for subsurface soil contamination in the loess.
- Determine the potential for groundwater contamination in the loess.
- Determine the suitability of the property for leasing by preparing a PRE.

This section summarizes the soil sampling tasks during the first phase of the CSI, which was conducted using a hand auger to collect a surface soil sample and Geoprobe equipment for subsurface soil sampling. The field sampling activities followed the procedures outlined in the U.S. Environmental Protection Agency (USEPA)- and Tennessee Department of Environment and Conservation-approved *Comprehensive RFI Work Plan* (E/A&H, 1994) and *Assembly C Site Investigation Plans* (E/A&H, 1995). Sample location descriptions and the rationale for sampled intervals are presented in Sections 4.1 and 4.2, respectively, of this CSI report. Section 4.3 presents the specific sampling protocols (sample processing, labeling, and chain-of-custody documentation).

Analytical Parameters

One surface soil sample was collected and analyzed to prepare a PRE to determine the suitability of the property for leasing. This sample was shipped to the National Environmental Testing, Inc. (NET) laboratory in Bedford, Massachusetts, and analyzed for semivolatile organic compounds (SVOCs) by USEPA Method 8270, chlorinated pesticides/polychlorinated biphenyls (PCBs) by USEPA Method 8080, and Appendix IX Metals by USEPA Method 6010/7000 series using a Level IV-equivalent Data Quality Objective (DQO).

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Twelve subsurface soil samples were collected in the Geoprobe investigation to determine the

nature and extent of contamination by specific metals associated with battery acid neutralization

at SWMU 26. Each sample was shipped to NET for the analyses of arsenic, cadmium, lead,

mercury, nickel, and zinc by USEPA Method 6010/7000 series using a Level III-equivalent

DQO for 95% of the samples and a Level IV-equivalent DQO for the remaining 5% of the

samples.

E/A&H validated the analytical results of the surface soil sample. Validata Chemical Services,

Inc., of Norcross, Georgia, validated the analytical results of the subsurface samples.

Attachment 1 contains the validation report, which indicates the overall data quality of the

analytical work is satisfactory.

Hand-Auger Sampling Methods

E/A&H collected a surface soil sample at SWMU 26 using a 3-inch diameter, stainless-steel

hand auger. The hand auger was advanced from land surface to a depth of 1 foot below

land surface (bls) using a clockwise motion. The soil collected in the auger was placed in a

stainless-steel bowl for processing.

Geoprobe Sampling Methods

E/A&H conducted a Geoprobe investigation at SWMU 26 to obtain subsurface soil samples for

metals analyses. Tri-State Testing Services, Inc., of Memphis, Tennessee, collected the

subsurface soil samples using a truck-mounted hydraulically-driven, Geoprobe soil sampling

system. Samples were obtained by advancing a 1-inch diameter soil probe to the desired

sampling depth. The 48-inch sampler, situated at the end of the probe, contained a "push point"

which retracted when the desired sampling interval was reached. The sampler was

then advanced through the sampling interval. The soil sample was then retrieved from the

borehole and the collected material removed from the sampler. The samples were collected in

4-2

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a stainless-steel sampler lined with an acetate sleeve, which minimized sample handling and

maintained sample integrity.

4.1 Investigation of Surface and Subsurface Soil

Surface Soil Investigation

One surface soil sample was proposed in Revision 0 of the Assembly C Confirmatory Sampling

Investigation Report (E/A&H, November 1995). The sample was collected immediately adjacent

and south of the former neutralization unit. Figure 4-1 shows the surface soil sample location.

Subsurface Soil Investigation

Four subsurface sampling locations were proposed in the Assembly C Site Investigation Plans

(E/A&H, 1995) to define the nature and extent of contamination, if any, associated with

the N-102 Acid Neutralization Unit. Three of the locations border the former neutralization

tank, and the fourth is along Funafuti Street, in a presumed upgradient location. Figure 4-1

shows the subsurface soil sampling locations.

4.2 Sampling Rationale and Methods

Surface Soil

Revision 0 of the Assembly C Confirmatory Sampling Investigation Report stated that one surface

soil sample would be collected from 0- to 1-foot bls (surface interval) immediately adjacent to

the neutralization unit. The sample was collected with a decontaminated stainless-steel hand

auger and immediately placed in a stainless-steel bowl and homogenized using a stainless-steel

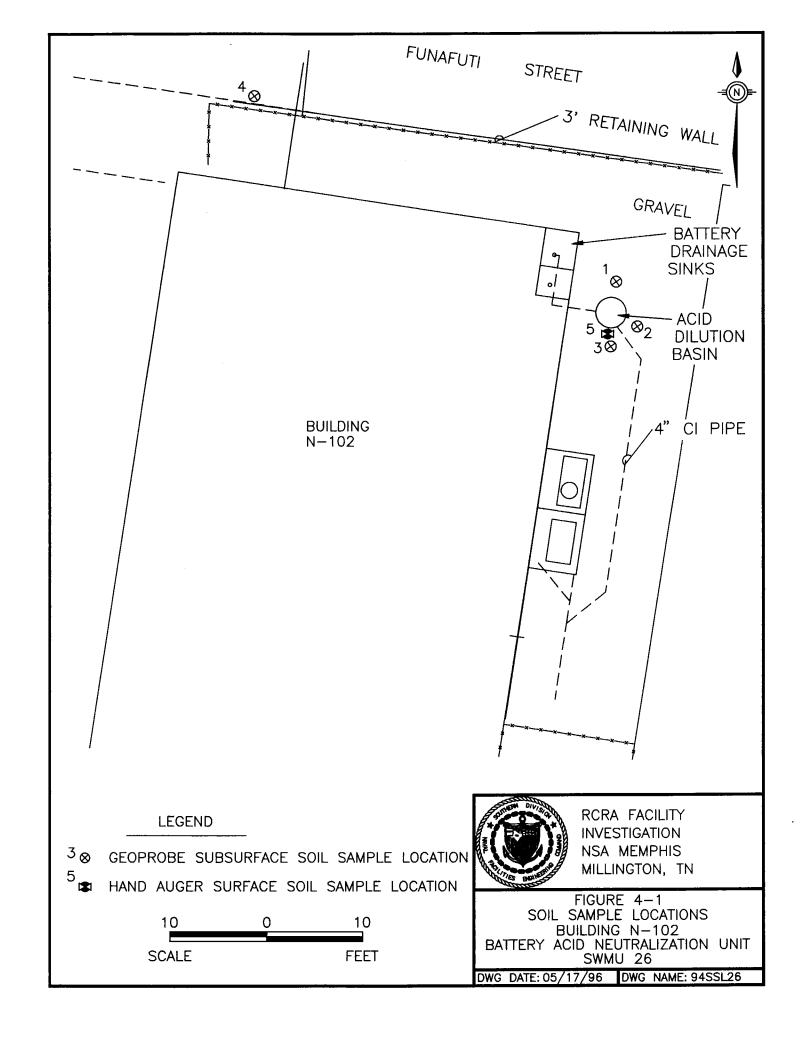
spoon in accordance with Section 4.2.10 of the Region IV USEPA Standard Operating

Procedures/Quality Assurance Manual and containerized as outlined in Section 4.4.4 of the

Comprehensive RFI Work Plan. After containerization, all samples were immediately placed on

ice for transport to the offsite laboratory.

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Subsurface Soil

The Assembly C Site Investigation Plans stated that the following samples would be collected from each Geoprobe location during the CSI:

- One subsurface soil sample from the 3- to 4-foot interval just below the unit's piping,
- One subsurface soil sample from the 6- to 7-foot interval, just below the base of the unit,
- One soil or groundwater sample from the soil/water interface in the loess

To determine the actual intervals to be sampled, the first Geoprobe boring (Location 1) was sampled continuously to 18 feet bls, where a sandy clay interval was encountered (soil/water interface); however, no groundwater samples could be collected from the loess. Based on field observations, the following intervals were selected for CSI sampling:

- One subsurface soil sample from the 3- to 4-foot interval just below the unit's piping,
- One subsurface soil sample from the 4- to 8-foot interval to provide information surrounding and beneath the unit, and
- One subsurface soil sample from the 16- to 18-foot interval, corresponding to the soil/water interface in the loess.

An exception to the above sampling strategy occurred at Location 4, where the deepest soil sampling interval was 13 to 15 feet due to a subsurface obstruction. An E/A&H geologist logged and processed the soil samples for submittal to the analytical laboratory. Tri-State collected the soil samples with the Geoprobe rig using the 1-inch diameter soil probe lined with an acetate sleeve. Each sample was placed in a stainless-steel bowl and homogenized using a stainless-steel spoon in accordance with Section 4.2.10 of the Region IV USEPA Standard Operating Procedures/Quality Assurance Manual and containerized as outlined in Section 4.4.4

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of the Comprehensive RFI Work Plan. After containerization, all samples were immediately

placed on ice for transport to the offsite laboratory.

The sampling protocol for surface and subsurface soil adhered to the approved Comprehensive

RFI Work Plan and the Assembly C Site Investigation Plans. Sample handling was minimized.

When transferring material from the sampling device to containers, the operation was conducted

expediently, in as clean an environment as possible. A new pair of disposable gloves was

donned before collecting each subsurface soil sample. Empty containers were kept packaged

until used, at which time they were immediately chilled and isolated in coolers.

4.3 Sample Processing and Chain-of-Custody Procedure

All samples collected in the field were labeled with a 10-digit alphanumeric code identifying the

site, sample type, sample location, and interval. The first three digits identify the site location,

and the fourth digit identifies the sample matrix. The next four digits identify the sampling

location, and the last two digits are the deepest point of the sampling interval. For example, the

sample label "026S000318" designates a SWMU 26 soil sample collected from Location 3 at a

maximum depth of 18 feet.

Clean sample containers provided by the testing laboratory were shipped to E/A&H in sealed

packages. Sample containers were labeled with the sample identification number, date,

sampler's name, and requested analytical parameter, then placed in a cooler immediately

following collection. Each sample was logged in the field logbook. Samples for offsite

laboratory analysis were prepared for shipment by wrapping each container individually in

bubble wrap, placing it in a resealable plastic bag, and packing it on ice inside a sturdy cooler.

Cooler lids were secured with packing tape and sealed with signed custody seals. Packaged

samples were then shipped overnight via FedEx priority service for next morning delivery. The

offsite laboratory was notified the day of shipment of the number of samples submitted. All

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sample shipments were reported to have arrived at NET in good condition and at the appropriate

temperature.

To ensure the integrity of the sample transfer process, a strict chain-of-custody procedure was

implemented. This procedure was initiated in the field for each sampling event and conducted

through custody transfer to the analytical laboratory. A chain-of-custody form was completed

for each batch of samples, itemizing sample numbers, containerization, preservatives, analyses

requested, date and time of sampling, and FedEx shipping number. Custody transfers were

recorded by signature, date, and time of relinquishment, and receipt of custody by the parties

involved.

4.4 Grouting Procedures

Tri-State filled each Geoprobe boring with neat cement grout following sample collection.

4.5 Decontamination Procedures

Tri-State decontaminated its downhole field equipment which did not come in contact with the

samples (i.e., rods, split-spoons) with a nonphosphate detergent and a deionized, organic-free

water rinse. All downhole equipment and sampling tools which could potentially contact the

collected samples were decontaminated before and after each use in accordance with guidelines

set forth in the Assembly C Site Investigation Plans, which consisted of the following steps:

• Wash with a hot soap and water mixture

• Rinse with potable water

Rinse with deionized organic-free water

Rinse twice with pesticide-grade isopropyl alcohol

Rinse with deionized organic-free water

Wrap with aluminum foil or plastic

4-9

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A new pair of disposable nitrile gloves was donned before handling decontaminated sampling equipment. Because subsurface soil samples were collected directly from the acetate sleeves within the stainless-steel sampler, and the surface soil sample was collected directly from the hand auger, the CSI generated no investigation-derived waste.

5.0 GEOLOGY AND HYDROGEOLOGY

5.1 Regional Geology and Hydrogeology

The general hydrogeology of the Memphis area is discussed in detail in Section 2.11 and a conceptual model of the hydrogeology at the NSA is presented in Section 2.12 of the Comprehensive RFI Work Plan (E/A&H, 1994). Updated information is available in the Hydrogeology of Post-Wilcox Group Stratigraphic Units in the Area of the Naval Air Station Memphis, Near Millington, Tennessee (Kingsbury and Carmichael, 1995), provided in Attachment 2 of this document. On the basis of this updated information, the hydrogeology of NSA Memphis is re-summarized below.

The two stratigraphic units investigated during the RFIs at NSA Memphis are the loess/alluvial deposits of Pleistocene and Holocene age and the underlying fluvial deposits of Pleistocene to Pliocene age. The loess — eolian deposits consisting of silt, silty clay, clay, and minor amounts of sand — is the principal unit occurring at land surface throughout the NSA Memphis Northside. Alluvium, which is restricted to stream valleys, includes alluviated or reworked loess. The loess is typically 0 to 65 feet thick in the Memphis area; at NSA Memphis it ranges from 15 to 45 feet thick (USGS, 1995). Water-bearing zones are present in the loess primarily in the upper part of this unit; however, yields are low and water quality analyses performed during the water use survey portion of previous underground storage tank investigations indicate that loess groundwater does not meet many primary and secondary drinking water standards. Previous investigations at NSA Memphis have found depth to water in the loess varying between 5 and 15 feet bls and vertical hydraulic conductivities to range from 10-6 to 10-8 centimeter per second (cm/sec). Although the loess may be considered an aquitard on the basis of the relatively low hydraulic conductivities, this shallowest water-bearing zone is present within this interval. Groundwater flow in the loess is primarily downward, although locally some groundwater in the loess may discharge to nearby streams, drainage ditches, and other surface water bodies.

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The fluvial deposits underlie the loess in upland areas and consist of sand, gravel, and some clay, with thin layers of ferruginous sandstone and conglomerate at the base. This unit ranges in thickness from 0 to 100 feet in the Memphis area; on the Northside of NSA Memphis it ranges from 10 to 60 feet thick and represents the most significant component of the surficial aquifer. Many shallow domestic wells in the Memphis rural areas are completed in the fluvial deposits. Relative groundwater elevations between wells completed in the loess/alluvium and fluvial deposits indicate semiconfined to confined conditions in the fluvial deposits. Typically a downward vertical gradient exists between water in the loess and the fluvial deposits. Sediments in the fluvial deposits generally coarsen with depth, and typically, the upper portion consists of a mixture of very fine sand with varying degrees of silt and clay and becomes increasingly less silty with depth, grading into a fine to medium sand near the middle of the unit. Grain sizes typically coarsen below this interval, grading into a gravelly sand near the fluvial deposits basal section.

The fluvial deposits are underlain by the Cockfield Formation, a part of the Jackson-upper Claiborne confining unit, which is a heterogeneous formation consisting of very fine silty sand interbedded with clay and silt lenses or clay with interbedded fine sand lenses. The Cockfield Formation ranges in thickness from approximately 35 to 180 feet in the NSA Memphis area. The more-permeable characteristics of the fluvial deposits, compared to the relatively impermeable properties of the overlying loess/alluvium and the underlying Jackson-upper Claiborne confining unit, result in the fluvial deposits being the preferential zone of groundwater flow and the route for contaminant transport in NSA Memphis's subsurface.

5.2 Site-Specific Geology and Hydrogeology

The following sections provide site-specific geologic and hydrogeologic information obtained from stratigraphic test borings, the Assembly A RFI investigation, and the SWMU 26 Geoprobe investigation.

5-2

Stratigraphic Test Borings

In 1994, the U.S. Geological Survey (USGS) drilled and sampled stratigraphic test hole 5, approximately 175 feet north-northeast of SWMU 26. Figure 1-1 shows the location of test hole 5. Attachment 2 of this document contains a copy of the previously referenced Kingsbury and Carmichael publication, which provides a geologic cross-section showing test hole 5 (USGS designation Sh:V-76). Stratigraphic test hole 5 was drilled 32 feet into the Cook Mountain Formation to better understand the site geology before monitoring well installations. Cuttings from the test hole were visually logged by a field geologist during drilling, and the test hole was geophysically logged to its total depth following completion. Stratigraphy and lithologies encountered in the test hole are as follows:

Loess: Approximately 30 feet of windblown silt and clay deposits.

Fluvial Deposits: Approximately 54 feet of sand and gravel.

Cockfield Formation: Approximately 104 feet of alternating sand and clay with

some lignite.

Cook Mountain Formation: Characterized as a light olive-gray to greenish-gray dense

clay. Defined as the upper confining unit between the surficial aquifers and the Memphis Aquifer. Because the stratigraphic test hole was only advanced 32 feet into the Cook Mountain Formation, the entire thickness is not

known.

Previous Investigations

Subsurface soil information was collected during the Assembly A RFI for SWMU 7, the Building N-126 Plating Shop Dry Well. SWMU 7 is approximately 900 feet west of SWMU 26. During the Assembly A investigation, nine monitoring-well clusters (designated 07MW01 through 07MW09) were installed at various locations around SWMU 7. Monitoring well clusters 07MW02, 07MW03, and 07MW06 are the closest to SWMU 26 (between 650 and 800 feet west and northwest). The general lithology encountered in the soil borings associated with these three clusters is as follows:

- Clayey silt, silty clay, and sandy clay from ground surface to between 25 and 34 feet bls (loess).
- Sand with gravel and silty clayey sand from between 25 and 34 feet bls to between 77 and 82 feet bls (fluvial deposits).
- Silty clayey sand, silty sand with clay lenses, clay with sand lenses, and lignite from between 77 and 82 feet to the termination depth of the boring (between 101 and 125 feet [Cockfield Formation]).

Laboratory-measured vertical hydraulic conductivities for the subsurface soil samples associated with the SWMU 7 monitoring wells are as follows:

Well Cluster	Associated Soil Sample ID	Sampling Depth (in feet)	Conductivity (in cm/sec)
07MW01	07S000177 07S0001112	75' to 77' (lower fluvial deposits) 110' to 112' (Cockfield Formation)	6.8 x 10 ⁻⁵ 4.1 x 10 ⁻⁸
07MW03	07S0003117	115' to 117' (Cockfield Formation)	1.6 x 10-8
07MW08	07S0008127	125' to 127' (Cockfield Formation)	8.7 x 10 ⁻⁷
07MW09	07S000922	10' to 22' (loess)	9.5 x 10 ⁻⁷

Monitoring well cluster 07MW01 is approximately 750 feet west-northwest of SWMU 26. Monitoring-well clusters 07MW03, 07MW08, and 07MW09 are 600 feet west-northwest, 1,100 feet west, and 1,050 feet west-northwest of SWMU 26, respectively. The boring logs and hydraulic conductivity data sheets for SWMU 7 are provided in Attachment 2.

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Based on the topography, the information contained in the conceptual model of the NSA Memphis hydrogeology (Section 2.12 of the *Comprehensive RFI Work Plan*), recent data collected during investigations at Assembly A SWMUs, and communication with USGS representatives, groundwater in the fluvial deposits flows locally toward the north-northeast. Groundwater flow in the loess is primarily downward, although locally, some groundwater in the loess may discharge to nearby streams, drainage ditches, and other surface water bodies.

SWMU 26 CSI

The deepest Geoprobe soil boring at SWMU 26 terminated at 18 feet bls. The E/A&H geologist described the lithology encountered during the Geoprobe investigation as a brown clayey silt (loess). The water-bearing zone in the loess (18 feet bls) was visually classified as a sandy clay.

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6.0 NATURE AND EXTENT OF CONTAMINATION

This section presents the analytical results for surface soil (0' to 1' bls) and subsurface soil (> 1' bls) samples collected during the CSI. One surface soil sample was collected and analyzed for SVOCs, pesticides/PCBs, and Appendix IX metals. Twelve subsurface soil samples (three intervals at four sampling locations) were collected and analyzed for the following six metals: arsenic, cadmium, lead, mercury, nickel, and zinc.

Detected concentrations of organic compounds and metals have been compared with media-specific guidance concentrations from the USEPA Region III Risk-Based Concentration (RBC) Table (July to December 1995) to evaluate the risk associated with exposure to soil contaminants and to evaluate the transfer potential of contaminants from soil to groundwater. In addition, inorganic concentrations for the soil samples are compared with established reference concentrations (RCs) derived from background samples at NSA Memphis to determine if they represent naturally occurring concentrations. Background RC calculations were provided in the Technical Memorandum — Assemblies A through D Background Reference Concentrations, E/A&H, September 18, 1996).

Specifically, surface soil sample results are compared with RCs, residential and industrial RBCs, and soil screening levels (SSLs); whereas subsurface soil sample results are compared with RCs and SSLs only.

Section 6.1 briefly discusses the criteria used to determine the RCs (two times the mean background concentration) for inorganics. Section 6.2 summarizes the detected contaminants in soil compared with the respective RBC and/or SSL values. Section 6.3 summarizes the contaminants detected at SWMU 26. Contaminants identified in surface soil are further evaluated in the Preliminary Risk Evaluation (Section 7).

6-1

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6.1 Background and Reference Criteria

Background locations were established at five areas at NSA Memphis (shown on Figure 6-1) to

determine ambient soil and groundwater quality conditions. Background data for soil consist of

12 samples collected from five boring locations. The background RC for each inorganic was

calculated by doubling the mean concentration detected. Two RCs were established for soil —

one for surface soil (0 to 1 foot bls) for use in preliminary risk evaluation and one for subsurface

soil (>1 foot bls) to evaluate the excess risk associated with exposure to the detected element

in soil and to determine if it occurs naturally. Tables 6-1 and 6-2 show the RCs for surface soil

and subsurface soil, respectively.

6.2 Soil Sample Analytical Results

The following sections summarize the results of soil samples collected during the CSI.

Appendix B contains the analytical data.

6.2.1 Surface Soil

One surface soil sample was collected and analyzed for pesticides/PCBs, SVOCs, and

Appendix IX metals. Figure 4-1 shows the surface soil sample location.

Pesticides/PCBs

No pesticides or PCBs were detected in the surface soil sample.

SVOCs

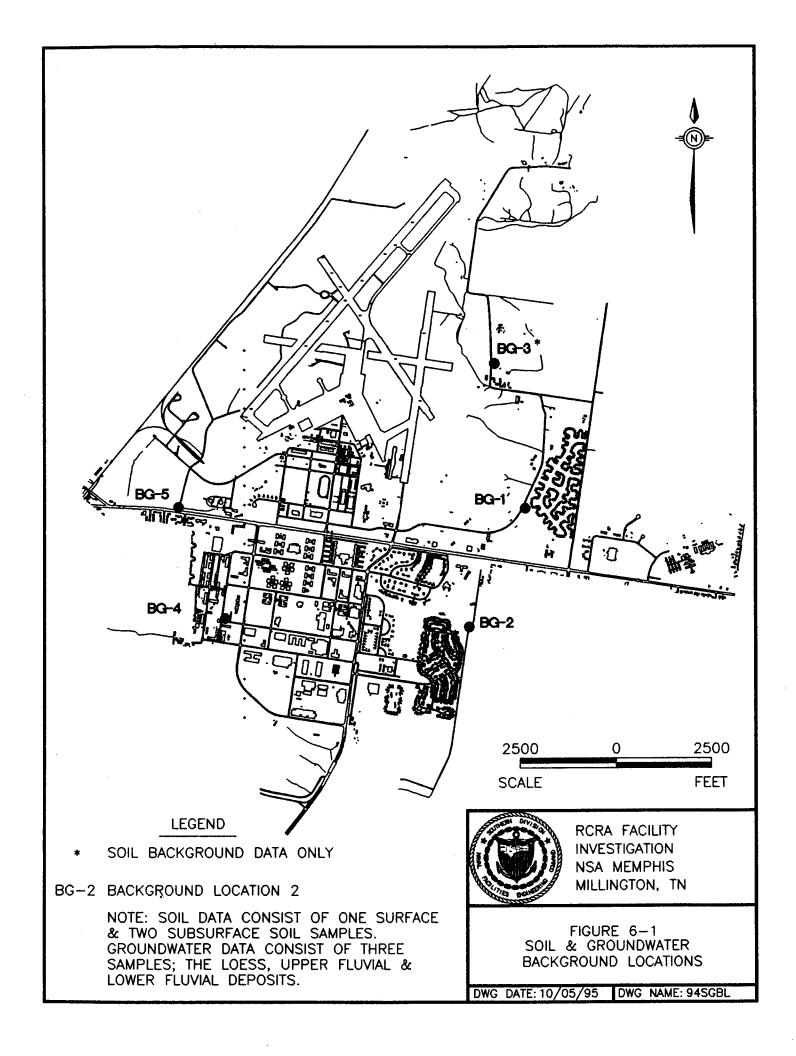
Eleven SVOCs were detected in the surface soil sample (refer to Table 6-1); however none of

the SVOCs exceeded the applicable SSLs. Only one SVOC, benzo(a)pyrene at 0.099 milligrams

per kilogram (mg/kg), exceeded the residential RBC (0.088 mg/kg), but did not exceed the

industrial RBC (0.78 mg/kg).

6-2



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Table 6-1
Detected Concentrations of Metals, Pesticides, and SVOCs in Surface Soil
SWMU 26 — Building N-102 Battery Acid Neutralization Unit
(data in milligrams per kilogram)

Sample Location/ID

Analyte	5 (0 - 1') 026S000501	RC• 0 - 1'	SSL*	RBC ^c Residential	RBC ^c Industrial
		Metals			
Antimony	ND4	ND		31	820
Arsenic	5.7	13.2	15	0.43	3.8
Barium	82.8	191	32	5,500	140,000
Beryllium	0.53 Je	0.96	180	0.15	1.3
Cadmium	ND	ND	6	39	1,000
Chromium	15.2 J	26.4	19	390	10,000
Cobalt	8,5 J	20,6	_	4,700	120,000
Copper	ND	27	-	3,100	82,000
Lead	19.5	28.7	Nonef	None	None
Мегсигу	ND	2.3	3	23	610
Nickel	21.8	ND	21	1,600	41,000
Selenium	ND	ND	3	390	10,000
Silver	1.6 J	ND		390	10,000
Vanadium	25	49.6	-	550	14,000
Zinc	65.1	88.3	42,000	23,000	610,000
Tin	ND	ND		47,000	1,000,000
	-	Organic Com	pounds		
Phenanthrene	0.12 J	_	1,400*	2,300#	61,000*
Fluoranthene	0.22 J		980	3,100	82,000
Pyrene	0.19 J		1,400	2,300	61,000
Benzo(a)anthracene	0.11 J		0.7	0.88	7.8
Chrysene	0.11 J		1	88	780
bis(2-Ethylhexyl)phthalate	0.061 J		11	46	410
Benzo(b)fluoranthene	0.11 J	—	4	0.88	7.8

Table 6-1 Detected Concentrations of Metals, Pesticides, and SVOCs in Surface Soil SWMU 26 — Building N-102 Battery Acid Neutralization Unit (data in milligrams per kilogram)

Sample Location/ID

	Analyte	•	5 (0 - 1') 026S000501	RC* 0 - 1'	SSL	RBC ^c Residential	RBC ^c Industrial
				Organic Com	pounds		
Benzo(l	k)fluorant	hene	0.089 J		4	8.8	78
Benzo(a	a)pyrene		0.099 J		4	0.088	0.78
Indeno(1,2,3-cd)	pyrene	0.048 J		35	0.88	7.8
Benzo(g	g,h,i)pery	lene	0.051 J		1,400s	2,300=	61,000*
SSL RBC ND	= = = = =	to 1-foot a five backg Memorand Soil Screen Risk-based denotes an denotes co Although to	concentration (2 x the m nd the greater than 1-foc round soil boring location. It me Assemblies A through the concentrations obtained alyte was not detected. Incentration is estimated. It concentration is estimated.	ot intervals below lar ons at various locations at various locations of the USEPA Region of the USEPA Region of the USEPA Relations of th	nd surface using analitions on the Northside Reference Concentration III Risk-Based Concegion III Risk-Based USEPA has published	ytical data from 12 soil le and Southside of NS. ations, E/A&H, Septem incentration Table, July de Concentration Table, July de a recommended soil s	samples collected fr A Memphis (<i>Techni</i> ber 18, 1996). - December, 1995. uly - December, 1995. ccreening concentrat
		of 400 mil	ligrams per kilogram (m	g/kg) for residential	lland use and 1 000	mg/kg for industrial la	nd use (Office of Sc

No RBCs exist for phenanthrene and benzo(g,h,i)perylene; the RBCs for pyrene were used as surrogates.

Bold indicates analyte exceeds the RC.

Italics indicates analyte exceeds the soil screening level.

Bold and Italics indicates analyte exceeds both the RC and the SSL.

LARGE PRINT indicates analyte exceeds the residential RBC.

111.8

42,000

Table 6-2
Detected Concentrations of Metals in Subsurface Soil
SWMU 26 — Building N-102 Battery Acid Neutralization Unit
(data in milligrams per kilogram)

Sample Location/ID 1 (3' - 4') 1 (4' - 8') 1 (16' - 18') 2 (3' - 4') 2 (4' - 8') 2 (16' - 18') Analyte 026S000104 026S000108 026S000118 026S000204 026S000208 026S000218 RC^a (2 x Mean Background) SSL Arsenic NDe 5.1 Ja ND 9.0 J 3.8 J ND 15 20.4 Cadmium ND ND ND ND 1.0 J ND 6.8 6 Lead 6.3 7.6 5.0 7.8 6.1 5.8 25.1 None* Nickel 11.8J 15.9 J 13.5 J 18.8 J 16.8 J 14.5 J 59.8 21 Zinc 29.2 32.3 17.7 42.0 31.6 15.1 111.8 42,000 3 (3' - 4') 3 (4' - 8') 3 (16' - 18') 4 (3' - 4') 4 (13' - 15') 4 (4' - 8') Analyte 026S000304 026S000308 026S000318 026S000404 026S000408 026S000415 RC^a (2 x Mean Background) SSL Arsenic 6.6 J ND ND 3.9 J 7.3 J ND 20.4 15 Cadmium 0.97 J 0.96 J 0.77 J 0.78 J 1.2 J ND 6.8 6 Lead 5.9 7,4 7.01 ND 5.2 6.5 25.1 None• Nickel 18.5 J 15.8 J 11.1 J 19.9 J 16.4 J 11.4 J 59.8 21

Notes:

Zinc

RC = Reference concentration (2 x the mean background concentration). Background concentrations were established for the 0 to 1-foot and the greater than 1-foot intervals below land surface using analytical data from 12 soil samples collected from five background soil boring locations at various locations on the Northside and Southside of NSA Memphis (Technical Memorandum — Assemblies A through D Background Reference Concentrations, E/A&H, September 18, 1996).

23.8

21.0

b SSL = Soil Screening Level; obtained from the USEPA Region III Risk-Based Concentrations Table, July to December 1995.

30.1

18.0

c ND = Compound not detected.

34.7

29.0

- d J = Estimated concentration.
- Although there is no published SSL for lead, USEPA has published a recommended soil screening concentration of 400 milligrams per kilogram (mg/kg) for residential land use and 1,000 mg/kg for industrial land use (Office of Solid Waste and Emergency Response Directive 9355.4-12).

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Appendix IX Metals

Ten Appendix IX metals were detected in the surface soil sample (refer to Table 6-1). The

residential and industrial RBCs, 0.43 mg/kg and 3.8 mg/kg, respectively, were exceeded for

arsenic (5.7 mg/kg), and the residential RBC (0.15 mg/kg) was exceeded for beryllium

(0.53 mg/kg); however, these metals occur naturally at NSA Memphis and were detected at

concentrations below their RCs (13.2 mg/kg and 0.96 mg/kg, respectively). The only metal that

exceeded its surface soil RC and SSL was nickel (21.8 mg/kg; RC = not detected, SSL =

21 mg/kg); however, this metal did not exceed its residential RBC (1,600 mg/kg). Silver,

detected at 1.6 mg/kg, also exceeded its RC (not detected); however, it did not exceed its

residential RBC (390 mg/kg) and no SSL exists for comparison.

6.2.2 Subsurface Soil

Twelve subsurface soil samples were collected during the CSI. Three intervals were sampled

at each of the four subsurface soil sampling locations shown on Figure 4-1. The samples were

analyzed for the metals arsenic, cadmium, lead, mercury, nickel, and zinc. Table 6-2

summarizes the analytical results for the subsurface soil samples.

Metals

Five metals were detected in the subsurface soil samples: arsenic, cadmium, lead, nickel, and

zinc. No mercury was detected in any sample. No detected metal exceeded either the RC for

subsurface soil or the SSL.

6.3 Summary of Nature and Extent

Soil analytical results indicate minimal contamination at SWMU 26. As shown on Table 6-1,

low concentrations of SVOCs were detected in the surface soil sample collected immediately

south of the neutralization unit, possibly originating from storm water runoff from the adjacent

asphalt parking lot. Only one SVOC, benzo(a)pyrene (0.099 mg/kg) exceeded its residential

RBC (0.088 mg/kg); however, it did not exceed either its industrial RBC or its applicable SSL.

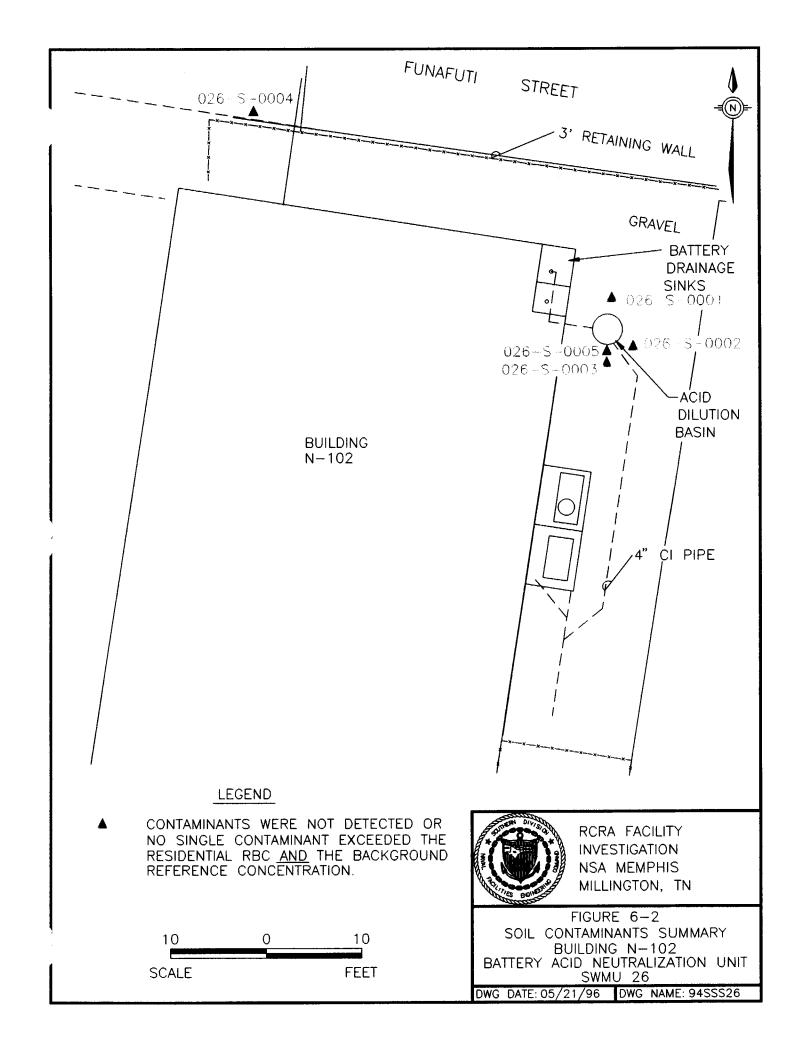
6-8

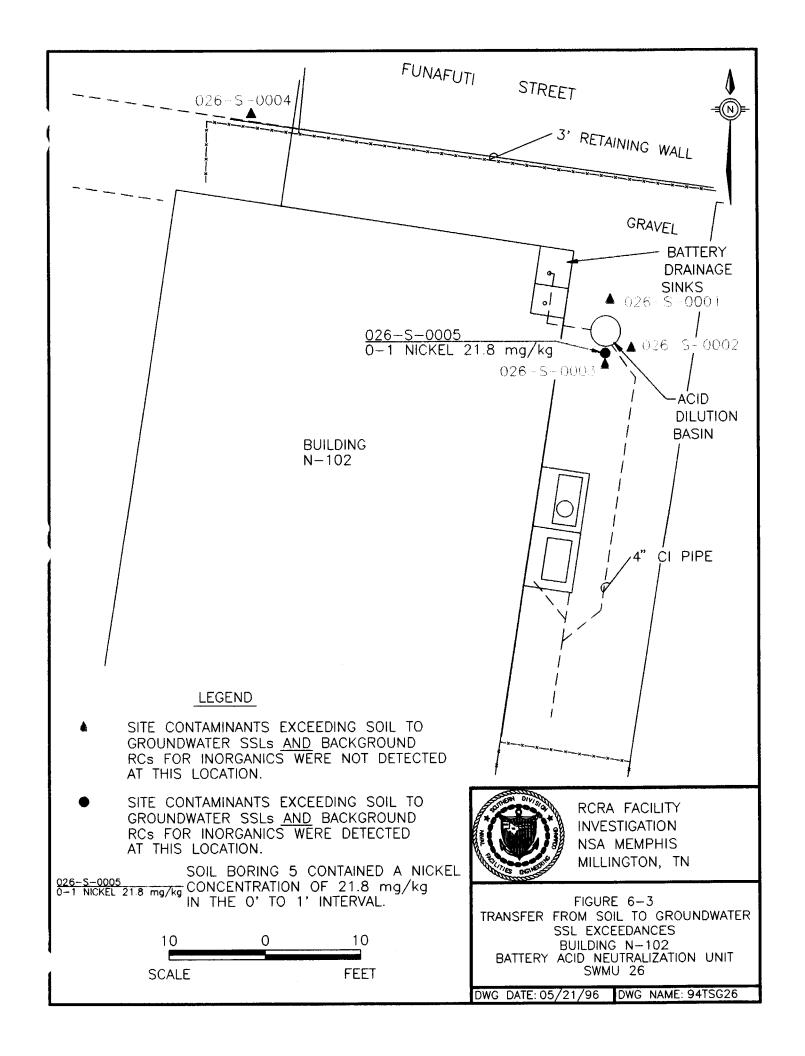
As shown on Figure 6-2, no contaminant detected in surface or subsurface soil exceeded its RC and residential RBC.

Contaminant Transfer from Soil to Groundwater

Tables 6-1 and 6-2 provide SSL values for transfer from surface and subsurface soil to groundwater, and Figure 6-3 illustrates the sample location where one or more contaminants exceeded both the RC and SSL. Figure 6-3 shows the only metal which exceeded the RC and SSL was nickel in the surface soil sample collected at location 5 (detected concentration = 21.8 mg/kg; RC = not detected, SSL = 21 mg/kg). It should be noted that nickel's RC for subsurface soil is 59.8 mg/kg.

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7.0 PRELIMINARY RISK EVALUATION

In accordance with Guidance on Preliminary Risk Evaluations for the Purpose of Reaching a Finding of Suitability to Lease (USEPA Region IV Memorandum, November 1994), a PRE was conducted for SWMU 26 to finalize its RCRA closure. One surface soil sample was collected from an unpaved area immediately adjacent to the south side of the neutralization unit (refer to Figure 4-1). The sample was shipped to an offsite laboratory (NET of Bedford, Massachusetts) under chain-of-custody documentation for the following analyses:

Analysis Method

Semivolatile Organic Compounds USEPA Method 8270

Chlorinated Pesticides/Polychlorinated Biphenyls USEPA Method 8080

40 CFR 264 Appendix IX Metals USEPA Method 6010/7000 Series

A PRE is conducted by constructing a table for carcinogenic and systemic (noncarcinogenic) compounds. The maximum concentration for each detected chemical and its corresponding RBC concentration are entered into the table to calculate cumulative human health risk. Soil data used in the calculations are exclusively from samples collected across the surface soil interval (0 to 1 foot bls).

Proportionate risk is calculated for each detected site chemical by comparing its maximum reported concentration with the corresponding RBC value. Risk and hazard for residential and commercial scenarios were calculated separately. RBC values were calculated by USEPA based on a risk threshold of 10-6 for carcinogens or a hazard quotient threshold of 1.0 for noncarcinogens. Therefore, a risk ratio is calculated for each contaminant by one of the following two equations:

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Carcinogenic Risk Ratio: $RR = \underline{media\ concentration} \times TR$

screening value

Noncarcinogenic Risk Ratio: $RR = \underline{media\ concentration} \times THQ$

screening value

where:

RR = the risk ratio

Media Concentration = the maximum concentration of a site chemical

Screening Value = the RBC value for that particular chemical

TR = target risk used by USEPA to calculate RBCs for

carcinogens (10-6)

THQ = target hazard quotient used by USEPA to

calculate RBCs for noncarcinogens (1.0)

Tables 7-1 and 7-2 summarize PRE results for SWMU 26 for carcinogens and noncarcinogens, respectively. The risk ratios for each chemical are summed separately for both residential and commercial scenarios to determine the overall site risk. Cumulative risk (for carcinogens) and cumulative hazard index (HI) (for noncarcinogens) are calculated separately, and the cumulative risk and HI are each compared to the corresponding cumulative threshold in accordance with the November 1994 USEPA Region IV Memorandum.

If the carcinogenic Incremental Lifetime Excess Cancer Risk (ILCR) is greater than 10⁻⁴ (the cumulative risk threshold) or the noncarcinogenic HI is greater than 1 (the cumulative HI threshold), the site may require additional investigation for the corresponding land use scenario (USEPA Region IV Memorandum, November 1994). If neither threshold is exceeded, the property is considered suitable to lease for the specified land use scenario.

Table 7-1
Preliminary Risk Evaluation for SWMU 26
Residential and Commercial Carcinogens
NSA Memohis CSI

NSA Memphis CSI						
	Reference		Residential RBC		Commercial RBC	
	Concentration	Maximum	Carcinogen	Risk	Carcinogen	Risk
Parameter	(mg/kg)	(mg/kg)	(mg/kg)	Ratio	(mg/kg)	Ratio
Arsenic	13.1	5.7	0.43		3.8	
Barium	19.1	82.8				
Benzo(a)anthracene		0.11	0.88	1.3E-07	7.8	1.4E-08
Benzo(a)pyrene		0.099	0.088	1.1E-06	0.78	1.3E-07
Benzo(b)fluoranthene		0.11	0.88	1.3E-07	7.8	1.4E-08
Benzo(g,h,i)perylene		0.051				
Benzo(k)fluoranthene		0.089	8.8	1.0E-08	78	1.1E-09
* Beryllium	0.96	0.53	0.15		1.3	
Bis(2-Ethylhexyl)phthala	te	0.061	46	1.3E-09	410	1.5E-10
Chromium	26.4	15.2				
Chrysene		0.11	88	1.3E-09	780	1.4E-10
Cobalt	15	8.5				
Fluoranthene		0.22				
Indeno(1,2,3-cd)pyrene		0.048	0.88	5.5E-08	7.8	6.2E-09
Lead	28.7	19.5				
Nickel	ND	21.8				
Phenanthrene		0.12				
Pyrene		0.19				
Silver	ND	1.6				
Vanadium	49.6	25				
Zinc	88.3	65.1				
		ILCR	SUM	1E-06	SUM	2E-07

NOTES:

ILCR Incremental lifetime excess cancer risk

HI Hazard index

Blank spaces Indicates not applicable

NO Not detected

- All concentrations are in parts per million (mg/kg).
- The maximum concentration reported for each contaminant was used to develop the table above.
- Soil sample data were from the surface (0-1') interval only.
- Screening values (RBCs) are from the July to December 1995
 Risk-Based Concentration (RBC) Table (October 20, 1995 USEPA
 Region III RBC memo).
- The maximum lead (Pb) concentration reported at SWMU 26 was 19.5 mg/kg. This is less than the 400 mg/kg residential soil screening level for total lead (USEPA OSWER Directive 9355.4-12).
- The RBC for pyrene was used as a surrogate for phenanthrene and benzo(g,h,i)perylene, which do not have RBCs.
- This metal was excluded from the risk ratio because the maximum reported concentration is less than the corresponding reference concentration.

Table 7-2
Preliminary Risk Evaluation for SWMU 26
Residential and Commercial Noncarcinogens
NSA Memphis CSI

	NOA MEMPILS CO.	Reference		Residential RBC	**	Commercial RBC	Hazard
		Concentration	Maximum	Noncarcinogen	Hazard	Noncarcinogen	
	Parameter	(mg/kg)	(mg/kg)	(mg/kg)	Ratio	(mg/kg)	Ratio
	America	13.1	5.7				
_	Arsenic	19.1	82.8	5500	0.015	140000	0.00059
	Barium	17.1	0.11	3500	0.015	1.000	******
	Benzo(a)anthracene						
	Benzo(a)pyrene		0.099				
	Benzo(b)fluoranthene		0.11			(1000	8.36E-07
	Benzo(g,h,i)perylene		0.051	2300	2.22E-05	61000	8.30E-U/
	Benzo(k)fluoranthene		0.089				
	Beryllium	0.96	0.53				
	Bis(2-Ethylhexyl)phthalate		0.061				
•	Chromium	26.4	15.2	390		10000	
	Chrysene		0.11				
*	Cobalt	15	8.5	4700		120000	
	Fluoranthene		0.22	3100	7.10E-05	82000	2.68E-06
	Indeno(1,2,3-cd)pyrene		0.048				
*	Lead	28.7	19.5				
	Nickel	ND	21.8	1600	0.014	41000	0.00053
	Phenanthrene		0.12	2300	5.22E-05	61000	1.97E-06
	Pyrene		0.19	2300	8.26E-05	61000	3.11E-06
	Silver	ND	1.6	390	0.0041	10000	0.0002
*		49.6	25	550		14000	
	Zinc	88.3	65.1	23000		610000	
			ні	SUM	0.033	SUM	0.0013

NOTES:

ILCR Incremental excess lifetime cancer risk
HI Hazard index
Blank spaces Indicates not applicable
ND Not detected

- All concentrations are in parts per million (mg/kg).
- The maximum concentration reported for each contaminant was used to develop the table above.
- Soil sample data were from the surface (0-1') interval only.
- Screening values (RBCs) are from the July to December 1995
 Risk-Based Concentration (RBC) Table (October 20, 1995 USEPA
 Region III RBC memo).
- The maximum lead (Pb) concentration reported at SWMU 26 was
 19.5 mg/kg. This is less than the 400 mg/kg residential soil
 screening level for total lead (USEPA OSWER Directive 9355.4-12).
- The RBC for pyrene was used as a surrogate for phenanthrene and benzo(g,h,i)perylene, which do not have RBCs.
- Compound was excluded from the risk ratio because the maximum reported concentration is less than the corresponding reference concentration.

Benzo(a)pyrene was the only organic compound that exceeded its residential RBC. No constituent exceeded both the applicable USEPA RBCs and the established background RC for surface soil samples at NSA Memphis.

This PRE does not evaluate the potential exposure that might be experienced by a construction worker should the acid neutralization unit be removed in the future. This would require an acute or subchronic assessment of subsurface soil data. USEPA uses an exposure duration of 25 years — a chronic exposure scenario. Exposure durations less than seven years, as would be assumed for a construction worker scenario, are considered acute or subchronic. USEPA used chronic-based toxicological information when calculating RBCs, or USEPA makes conservative adjustments to reflect chronic exposure. In addition to the effect the exposure duration differences would have on a construction worker's cumulative risk and hazard estimates, toxicological information used by USEPA to calculate RBCs would be adjusted to reflect acute or subchronic toxicological endpoints rather than the chronic endpoints typically used. Acute and subchronic thresholds are based on lower exposure durations than chronic thresholds, and higher concentrations are generally necessary to elicit observable toxic effects. Higher thresholds for toxic effects result in less conservative toxicological information, which would be used to adjust RBCs for either acute or subchronic exposure. Because a construction worker would be exposed under either acute or subchronic conditions, and RBCs based on chronic exposure are generally more conservative, the commercial site worker scenario presented in this PRE would be a more conservative scenario than that for a construction worker.

The Preferred Reuse Alternative in the *Base Reuse and Development Plan* (RKG Associates Inc., 1995), indicates the most likely reuse of the parcel of land containing SWMU 26 will be for light industrial operations. Due to the nature of this proposed use, a commercial setting can be assumed to evaluate risk. With respect to the commercial scenario, the resulting ILCR and HI were well below the established criteria of 10⁻⁴ and 1, respectively. In addition, the resulting

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ILCR and HI for the residential scenario were below the established 104 ILCR threshold and

the HI threshold of 1.

Conclusions and Recommendations

Based on the information gathered during this investigation, the following conclusions and

recommendations have been reached:

• SWMU 26 will likely be used for light industrial operations.

• Twenty-one semivolatile organic compounds and inorganics were detected in the soil

sample collected from the surface interval.

Maximum reported concentrations of arsenic and beryllium exceeded residential soil

RBCs, and the reported concentration for arsenic exceeded the corresponding commercial

RBC. However, the detected concentrations of arsenic and beryllium do not exceed the

background RCs as shown on Tables 7-1 and 7-2.

Based on a PRE performed on data from the sample collected from the 0 to 1-foot bls

interval:

Carcinogens — Both the commercial and residential ILCRs did not exceed the 10-4

threshold, indicating suitability for lease with no further action for both

commercial and residential land use.

- Noncarcinogens — Both the *commercial* and *residential* HIs did not exceed 1,

indicating suitability for lease with no further action for both commercial and

residential land use.

7-6

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8.0 CONCLUSIONS AND RECOMMENDATIONS

One surface soil sample collected next to the neutralization unit was analyzed for SVOCs, pesticide/PCBs, and Appendix IX metals, and the results were used to prepare a PRE. Subsurface soil samples were collected from three intervals at three locations surrounding the N-102 Battery Acid Neutralization Unit and from one location next to the sanitary sewer line which runs along the south side of Funafuti Street. The samples were analyzed for the following metals: arsenic, cadmium, lead, nickel, mercury, and zinc. Based on the results of this investigation, the following conclusions have been reached:

- Low concentrations of SVOCs were detected in the surface soil sample collected immediately south of the neutralization unit, likely originating from storm water runoff from the adjacent asphalt parking lot. Only one SVOC, benzo(a)pyrene, exceeded its residential RBC; however, it did not exceed its industrial RBC or its applicable SSL. Two inorganics in the surface soil sample exceeded RBCs. Arsenic exceeded the industrial RBC, and beryllium exceeded the residential RBC. However, arsenic and beryllium are naturally occurring compounds at NSA Memphis, and neither detected concentration exceeded its respective RC or SSL. The only inorganic which exceeded both the RC and the SSL was nickel in the surface soil sample; however, the detected concentration did not exceed the residential RBC. It should be noted that nickel's RC for subsurface soil is 59.8 mg/kg.
- Detected concentrations of inorganics in each subsurface soil sample did not exceed their
 RCs (2 times the mean background concentration) or USEPA SSLs.
- The PRE concluded that the property is suitable for lease for either residential or commercial land use.

Based on the results of the Geoprobe investigation and the PRE at SWMU 26, no further action is recommended for this site.

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9.0 REFERENCES

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Appendix A

Analytical Results — N-102 Battery Acid Neutralization Unit Contents

TESTING & CONSULTING INC. **ENVIRONMENTA®** 2924 WALNUT GROVE RD - MEMPHIS, YN 38111 - PHONE (901) 327-2760 FAX (901) 327-6394

July 14, 1992

Ms. Jan Campbell Del-Jen, Inc. (NAS) P.O. Box 84188 Hillington, TN 38054

REF: ANALYTICAL TESTING SAMPLE DATE: 6/29/92

SITE ID: SAMPLE ID: NAS

SWM4 #Z6

NORTH 102 BATTERY ACID (LIQUID-SOLID)

Dear Ms. Campbell:

The above referenced sample his been analyzed per your instructions. The tests were performed in or laboratory (#02027) in accordance with the Solid Waste Hanual, SW-84. The sample was leached/filtered according to Hethod 1311, Toxicity Characteristic Leaching Procedure. The results are shown on the attached Analysis Data Sheets.

Please call our office if you have any questions.

Sincerely,

Randall H. Thomas Vice President

jŵ

Attachment

0629-034

Post-It and fax transmittal memo 7671 of pages > 5000 40,0 Dept. Fm 966-5461 FARE OSN 63-0465

ENVIRONMENTAL TESTING AND CONSULTING, INC. MEMPHIS, TN FCLP METALS

¢lient Name : Del-Jen, Inc.

site ID : NAS

Sample ID : NORTH 102 BATTERY ACID Sample Date : 6/29/92 bate Arrived : 6/29/92

File Name : _0629-034_ Sample ID : _0629-034-1

hate of TCLP Extraction : 7/01/92, Leachate/Filtrate Combined Latrix Classification : Miscellaneous/Liquid-Solid

Metals	Results (ppm)	MS REC1	Results Fec(ppm) ²	Regulat Level (ppm)	Method (SW-846)	Date Analyzed	Ву
Arsenic Barium Cadmium Chromium Lead Mercury Silver Selenium VOCs BNAs	0.061 0.30 0.066 <0.02 2.66 0.0015 <0.01 0.006 See Atta		0.30 0.066 0.02 2.80 0.0015	5.0 100.0 1.0 5.0 5.0 0.2 5.0	7061 7080 7130 7190 7420 7470 7760 7741	7/08/92 7/02/92 7/02/92 7/01/92 7/09/92 7/01/92 7/02/92 7/08/92	JF BB BB BB JF BB JF

Peteotion Peteotion	Limits (ppm)
Arsenic	0.002
Barlum	0.03
Cadmium	0.002
Chromium	0.02
Hergury Lead	0.05
Hercury	0.001
Bilver	0.01
Bilver Selenium	0.002

- Matrix Spike (1) Percent Recovery for Matrix Classification - Sample results factored for Matrix Recovery Bias per Federal Regist June 29, 1990.

NF - No Factor applied.

Randall H. Thomas Vice President

4

ENVIRONHENTAL TESTING AND CONSULTING, INC.

HEHRHIS, TN
ORGANIC ANALYSIS DATA SHEET
TCLP BASE NEUTRALS AND ACID EXTRACTABLES

CLIENT NAME 1 _DEL-JEN, INC. PROJECT # SITE ID _NAS _RR ANALYST 1 ı SAMPLE ID NORTH 102 BATTER ACID SAMPLE DATE : _06/29/92 DATE ARRIVED : _0629-034.DOC_ : _0629-034____ _06/29/92 FILE NAME : MATRIX TCLP LEACHATE/FILTRATE SAMPLE # DATE OF TCLP EXTRACTION : _07/01/9 : _HISC LIQUID/SOLID MATRIX CLASSIFICATION ______METHOD (SW-846): _8270 DATE EXTRACTED - _07/08/97 DATE ANALYZED : _07/16-17/92 REGULATOR' SAMPLE NS SAMPLE REC² DL1 RESULTS **LBVEL** RESULTS FAC(ppm)3 COMPOUND (%) (mqq) (ppm) (mqq) _0.05 0.13 2, #-Dinitrotoluene BDL NF BDL 0.13 Hexachlorobenzene BDL _0.05 NF BDL BDL _0.05 0.50 NF Hekachlorobutadiene BDL _0.05 3.00 NF BDL Hekachloroethane BDL _0.05 200 ADL 2-Hethylphenol(o-cresol) NF BDL _200 3-Methylphenol(m-cresol) BDL NF BDL _0,05 _0.05 _200. 4-Methylphenol(p-cresol) NP BDL BUL _0.05 2.00 Nitrobenzene NP BOL BDL Pentachlorophenol
2,8,5-Trichlorophenol
2,8,6-Trichlorophenol
Pyridine _0.05 100 0.06 85 0.05 NF _400, _0.05 BOL BDL _0.05 2.00 NF BDL BDL BDL _0.05 _5.00__ NF BDL. QC LINITS EXP(ng/ul) **TREC** SURROGATE STANDARDS RESULT _111 111 35-114 Nitrobenzene-d5 100 2-Fluorobiphenyl 112 43-116 100 _112 4-Terphonyl-014

DETECTION LIMIT

2,4,6-Tribromophenol 2-Fluorophenol

_104

_171

199

196

100

200

200

200

104

100

.86

98

33-141

10-123

21-100

10-94

BUL - BELOW DETECTION LIMIT - NO FACTOR APPLIED.

Algoritory Hanager

Phenol-D6

1

2

⁻ MATRIX SPIKE RECOVERY FOR HATRIX CLASSIFICATION - SAMPLE RESULTS FACTORED FOR MATRIX RECOVERY BIAS PER FEDERAL REGISTE JUNE 29, 1990.

ENVIRONMENTAL TESTING AND CONSULTING, INC. HEMPHIS, TN ORGANIC ANALYSIS DATA SHEET TCLP VOLTTILE COMPOUNDS

PROJECT ! CLIENT NAME : _DEL-JEN, INC. _LS SITE ID ANALYST I _NAS NORTH 102 BATTERY ACID SAMPLE ID SAMPLE DATE : _06/29/92_ : _06/29/92 : _TCLP LEACHATE/F LTRATE FILE NAME : _0629-034.DOC_ SAMPLE # : _0629-034____ DATE ARRIVED MATRIX

DATE OF TCLP EXTRACTION : _07/01/2_ HATRIX CLASSIFICATION : _HISC L QUID/SOLID

DATE ANALYZED : _07/14/92_ METHOD (SW-846): _8240____

сонроинд	SAMPLE RESULTS (ppm)	_	HS REC ² (*)	SAMPLE RESULTS PAC(ppm) ³	DL ¹ (ppm)	REGULATOI LEVEL (ppm)
Benzene Carbon Tetrachloride Chlorobenzene Chloroform 1,4-Dichlorobenzene 1,2-Dichloroethane 1,1-Dichloroethane Methyl Ethyl Ketona Tetrachloroethene Trichloroethene Vinyl Chlorida	BDL		NF NF NF NF NF NF NF NF	BOL	_0.005 _0.005 _0.050 _0.050 _0.005 _0.005 _0.005 _0.005	0.50. 0.50. 100 6.00. 7.50. 0.50. 0.70. 200 0.70. 0.50. 0.20

SURROGATE STANDARDS	RESULT	EXP(ug/L)	*REC	QC LIMITS
1/2-Dichloroethane-d4	_39.9	50.0	80	76-114
Toluene-d8	_45.3_	50.0	91	88-110
4-Bromofluorobenzene	_46.6	50.0	93	86-115

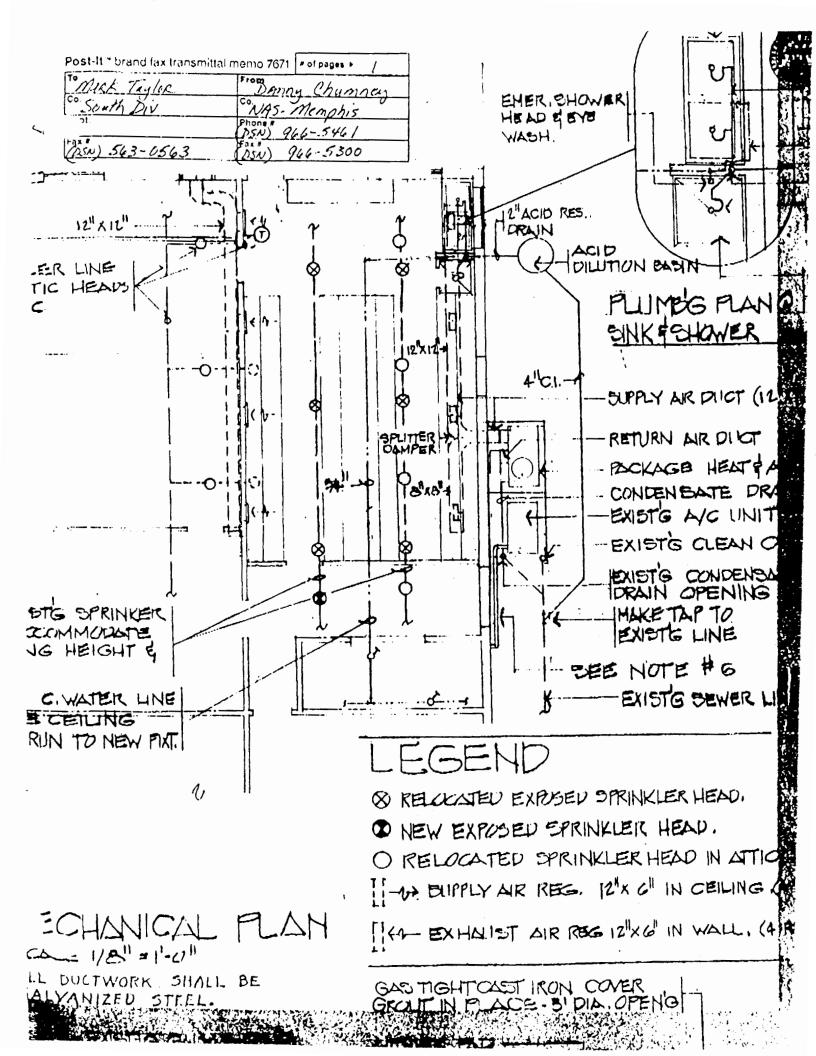
1 - DETECTION LIHIT

- HATRIX SPIKE RECOVERY FOR MATRIX CLASSIFICATION.
- SAMPLE RESULTS PACTORED FOR MATRIX RECOVERY BIAS PER FEDERAL REGIST!
JUNE 29, 1990.
BDL - BELOW DETECTION LIMIT

#F - NO FACTOR APPLIED.

LABORATOR MANAGER

Post-It* brand fax transmittal	mema 7671 (# of pages > 4
James whethy	From Lt. GRUZESKY
Co-Southern Division	CONAS - Memphis
Dept.	Phone : 966 - 5461
ASN 563-0965	(DSN) 964-5300



Appendix B

Analytical Results for Surface and Subsurface Soil Samples

FORMAT: XXXX \ 1 2 3 4 5 6 7 8 9 0

XXXX \ OPTIONAL project prefix

· SITE where sample collected 1 2 3

- MATRIX / QC code 5 6 7 8 - SAMPLING LOCATION

90 · DEPTH, INTERVAL, SERIAL #

All spaces MUST be filled and no extra characters included. Use zeroes as space-fillers. Indicate MS/MSDs on COCs.

MATRIX/QC CODES:

- S soil (surface, borings, and trenches)
- C soil duplicate sample
- M sediment (settled, fluid-borne solid)
- N sediment duplicate
- G groundwater
- H groundwater duplicate sample
- W surface water
- R surface water duplicate sample
- U sludge
- Y sludge duplicate
- A air
- Z liquid waste (including IDW drums)
- V solid waste (including IDW drums)
- T trip blank
- E equipment rinsate blank
- D DI system blank
- P potable water blank
- F field blank
- L filter blank
- B EPA blind spike sample
- 2 cement blank
- 3 drilling mud
- 4 grout blank
- 5 bentonite blank
- 6 sand blank

DATALCP3

NSA MEMPHIS

Page:

ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> MATRIX>	026-S-0005-01 026SSB0501 143764S 026SSB0501 03/06/96 Soil MG/KG			
CAS # Parameter	1719 VAL	tribus igit in a		
SB Antimony AS Arsenic BA Barium BE Beryllium CD Cadmium	7.3 UR 5.7 82.8 0.53 J 1.2 UJ			
CR Chromium CO Cobalt CU Copper PB Lead HG Mercury	15.2 J 8.5 J 15.6 U 19.5 0.12 U	and Alberta		
NI Nickel SE Selenium AG Silver TL Thallium	21.8 0.34 U 1.6 J 0.49 U			
V Vanadium ZN Zinc SN Tin	25. 65.1 28.3 U		i septimin	
				i.

DATALCP3 05/17/96

NSA MEMPHIS NSA MEMPHIS, RFI, ASSEMBLY C SWMU 26 - SURFACE SOIL SAMPLES

Page: 2 Time: 13:02

05/17/96			MEMPHIS, RFI 26 - SURFACE	S	11me: 15:02
SW846-PEST	SAMPLE ID> ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> DATE EXTRACTED> DATE ANALYZED> MATRIX> UNITS>	026-S-0005-01 026SSB0501 143764 026SSB0501 03/06/96 03/11/96 03/15/96 Soil ug/Kg			
CAS	# Parameter	1719 VAL			
319-84-6 319-85-7 319-86-8 58-89-9 76-44-8 309-00-7 1024-57-7 959-98-8 60-57-72-55-9 72-20-8 33213-65-9 72-54-7 1031-07-1 50-29-7 7421-93-5103-71-5103-74-8 8001-35-12789-03-	alpha-BHC beta-BHC delta-BHC gamma-BHC (Lindane) Heptachlor Aldrin Heptachlor epoxide Endosulfan I Dieldrin 4,4'-DDE Endrin Endosulfan II 4,4'-DDD Endosulfan sulfate 4,4'-DDT Methoxychlor Endrin ketone Endrin aldehyde alpha-Chlordane gamma-Chlordane Toxaphene Technical Chlordane Aroclor-1016	2. U			
11104-28- 11141-16- 53469-21- 12672-29- 11097-69-	2 Aroclor-1221 5 Aroclor-1232 9 Aroclor-1242 6 Aroclor-1248 1 Aroclor-1254 5 Aroclor-1260	41. U 41. U 41. U 41. U 41. U 41. UJ			

DATALCP3 05/17/96

NSA MEMPHIS NSA MEMPHIS, RFI, ASSEMBLY C SWMU 26 - SURFACE SOIL SAMPLES

Page: 3 Time: 13:02

SM846-SVOA	SAMPLE ID> ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> DATE EXTRACTED> DATE ANALYZED> MATRIX> UNITS>	026-S-0005-01 026SSB0501 143764 026SSB0501 03/06/96 03/11/96 03/12/96 Soil ug/Kg					
CAS #	Parameter	1719 VA	L NAME				
95-57-8 541-73-1 106-46-7 95-50-1 95-48-7 108-60-1 106-44-5 621-64-7 67-72-1	Phenol bis(2-Chloroethyl)ether 2-Chlorophenol 1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,2-Dichlorobenzene 2-Methylphenol (o-Cresol) 2,2'-oxybis(1-Chloropropane) 4-Methylphenol (p-Cresol) N-Nitroso-di-n-propylamine Hexachloroethane Nitrobenzene	430. U 430. U					
78-59-1 88-75-5 105-67-9 120-83-2 120-82-1	Isophorone 2-Nitrophenol 2,4-Dimethylphenol 2,4-Dichlorophenol 1,2,4-Trichlorobenzene	430. U 430. U 430. U 430. U 430. U		후 ·			
106-47-8 111-91-1 87-68-3 59-50-7	Naphthalene 4-Chloroaniline bis(2-Chloroethoxy)methane Hexachlorobutadiene 4-Chloro-3-methylphenol 2-Methylnaphthalene	430. U 430. U 430. U 430. U 430. U			Minutes of the second of the s		
77-47-4 88-06-2 95-95-4 91-58-7	Hexachlorocyclopentadiene 2,4,6-Trichlorophenol 2,4,5-Trichlorophenol 2-Chloronaphthalene	430. U 430. U 1100. U 430. U 1100. U					
131-11-3 208-96-8 606-20-2 99-09-2	2-Nitroaniline Dimethyl phthalate Acenaphthylene 2,6-Dinitrotoluene 3-Nitroaniline	430. U 430. U 430. U 1100. U					
51-28-5 100-02-7	Acenaphthene 2,4-Dinitrophenol 4-Nitrophenol Dibenzofuran	430. U 1100. U 1100. U 430. U					

DATALCP3 05/17/96

NSA MEMPHIS NSA MEMPHIS, RFI, ASSEMBLY C SWMU 26 - SURFACE SOIL SAMPLES

Page: 4 Time: 13:02

SWPIO 20 - SORFACE BOTH STATE BE									
SM846-SVOA SAMPLE ID	026SSB0501 143764 026ssb0501 03/06/96 03/11/96 03/12/96								
CAS # Parameter	1719 VAL	네이어 15명 전 15명보다 (15명보도) 1명보고 1 시대 15명 15명보고 15통 15명보다 15명보고 1 1명보고 1							
121-14-2 84-66-2 7005-72-3 4-Chlorophenylphenylether 86-73-7 100-01-6 534-52-1 86-30-6 N-Nitrosodiphenylamine 4-Bromophenyl-phenylether 87-86-5 85-01-8 18-74-1 87-86-5 85-01-8 120-12-7 86-74-8 84-74-2 206-44-0 129-00-0 85-68-7 91-94-1 56-55-3 218-01-9 117-84-0 205-99-2 207-08-9 50-32-8 191-24-2 Pinitrotoluene 2	430. U 430. U 430. U 430. U 1100. U 1100. U 430. U 110. J 110. J 110. J 110. J 110. J 89. J 99. J 48. J 430. U 51. J	A							

DATALCP3 10/30/95

NAS MEMPHIS NAS MEMPHIS, RFI, ASSEMBLY C SWMU 26 - Primary Samples

Page: 1 Time: 11:24

SWMU 26 - Primary Samples										
METAL	SAMPLE ID> ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> MATRIX> UNITS>	026-s-0001-04 026s000104 4-124590s 026s000104 06/05/95 Soil MG/KG	026-s-0001-08 026s000108 4-124591s 026s000108 06/05/95 Soil MG/KG	026-S-0001-18 026S000118 4-124592S 026S000118 06/05/95 Soit MG/KG	026-S-0002-04 026S000204 4-124593S 026S000204 06/05/95 Soil MG/KG	026-s-0002-08 026s000208 4-124594s 026s000208 06/05/95 Soil MG/KG	026-s-0002-18 026s000218 4-124595s 026s000218 06/05/95 Soil MG/KG			
CAS # Parameter		1439 VAL	1439 VAL	1439 VAL	1439 VAL	1439 VAL	1439 VAL			
AS Arsenic CD Cadmium Lead HG Mercury NI Nickel ZN Zinc SB Antimony BA Barium BE Beryllium CR Chromium CO Cobalt CU Copper SE Selenium AG Silver TL Thallium V Vanadium SN Tin		3.6 UJ 0.75 UJ 6.3 0.13 U 11.8 J 29.2 NR NR NR NR NR NR NR NR NR NR	5.1 J 0.76 UJ 7.6 0.12 U 15.9 J 32.3 NR	2. UJ 0.73 UJ 5. 0.12 U 13.5 J 17.7 NR	9. J 0.79 UJ 7.8 0.13 U 18.8 J 42. NR NR NR NR NR NR NR NR NR NR	3.8 J 1. J 6.1 0.12 U 16.8 J 31.6 NR	2.9 UJ 0.72 UJ 5.8 0.12 U 14.5 J 15.1 NR			

DATALCP3 10/30/95

NAS MEMPHIS NAS MEMPHIS, RFI, ASSEMBLY C SWMU 26 - Primary Samples

Page: 2 Time: 11:24

METAL	SAMPLE ID> ORYGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> MATRIX> UNITS>	026-S-0003-04 026S000304 4-124596S 026S000304 06/05/95 Soil MG/KG	026-S-0003-08 026S000308 4-124597S 026S000308 06/05/95 Soil MG/KG	026-S-0003-18 026S000318 4-124598S 026S000318 06/05/95 Soil MG/KG	026-S-0004-04 026S000404 4-124599S 026S000404 06/05/95 Soil MG/KG	026-s-0004-08 026s000408 4-124600s 026s000408 06/05/95 Soil MG/KG	026-S-0004-15 026S000415 4-124601S 026S000415 06/05/95 Soil MG/KG
CAS # Parameter		1439 VAL	1439 VAL	1439 VAL	1439 VAL	1439 VAL	1439 VAL
AS Arsenic CD Cadmium Lead HG Mercury NI Nickel ZN Zinc SB Antimony BA Barium BE Beryllium CR Chromium CO Cobalt CU Copper SE Selenium AG Silver TL Thallium V Vanadium SN Tin		6.6 J 0.97 J 5.9 0.12 U 18.5 J 34.7 NR	0.49 UJ 0.96 J 7.4 0.12 U 15.8 J 29. NR	1.1 UJ 0.77 J 7.1 0.12 U 11.1 J 18. NR	3.9 J 0.78 J 0.49 U 0.12 U 19.9 J 30.1 NR NR NR NR NR NR NR	7.3 J 1.2 J 5.2 0.12 U 16.4 J 23.8 NR	1.7 UJ 0.68 UJ 6.5 0.12 U 11.4 J 21. NR

ASSEMBLY C CSI REPORT NAVAL SUPPORT ACTIVITY MEMPHIS MILLINGTON, TENNESSEE

RCRA FACILITY INVESTIGATION SWMU 27 — NORTHSIDE SEWAGE TREATMENT PLANT

REVISION 2

CTO-094

Contract No: N62467-89-D-0318

Prepared for:

Department of the Navy Southern Division Naval Facilities Engineering Command North Charleston, South Carolina

Prepared by:

EnSafe/Allen & Hoshall 5720 Summer Trees Drive, Suite 8 Memphis, Tennessee 38134 (901) 383-9115

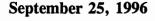


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Appendix A Analytical Data

LIST OF ACRONYMS AND ABBREVIATIONS

BRAC Base Realignment and Closure

bls below land surface cm/sec centimeters per second

CSI Confirmatory Sampling Investigation

DQO Data Quality Objectives E/A&H EnSafe/Allen & Hoshall

ft/day feet per day HI Hazard Index

ILCR Incremental Lifetime Excess Cancer Risk

MCL maximum contaminant level

 $\mu g/L$ micrograms per liter mg/kg milligrams per kilogram

ND not detected

NET National Environmental Testing, Inc.

NSA Naval Support Activity (formerly Naval Air Station)

PCBs polychlorinated biphenyls
PRE preliminary risk evaluation

QA/QC Quality Assurance/Quality Control

RBC risk-based concentration RC reference concentration

RCRA Resource Conservation and Recovery Act

RFI RCRA Facility Investigation SWMU solid waste management unit

SSL soil screening level STP sewage treatment plant

SVOC semivolatile organic compound

THO target hazard quotient

TR target risk

USEPA U.S. Environmental Protection Agency

VOC volatile organic compound

VSI visual site inspection

EXECUTIVE SUMMARY

The Assembly C Site Investigation Plans (E/A&H 1995) proposed two phases of investigation for a Confirmatory Sampling Investigation (CSI) at Solid Waste Management Unit (SWMU) 27, the Northside Sewage Treatment Plant at Naval Support Activity (NSA) Memphis. The first phase consisted of a hand-auger and Geoprobe investigation of the former sludge drying beds. Based on the results of the first phase, the second phase, consisting of advancing and sampling soil borings and monitoring wells, is not required. This report summarizes the activities conducted during the CSI's first phase and the resulting findings and conclusions.

During the Geoprobe investigation, nine surface soil and 18 subsurface soil samples collected from nine sampling locations were analyzed for volatile organic compounds (VOCs) and Appendix IX metals. To finalize the Resource Conservation and Recovery Act closure of the SWMU, a hand auger was used to collect additional surface soil at three of the sampling locations in the sludge drying beds; these samples were analyzed for semivolatile organic compounds (SVOCs) and pesticides/polychlorinated biphenyls. The surface soil sample results were used to prepare a Preliminary Risk Evaluation (PRE). Groundwater samples were collected from the upper fluvial deposits with a Geoprobe at six of the nine soil sampling locations. The groundwater samples were analyzed for VOCs only.

The only VOCs identified in surface and subsurface soil were low concentrations of isopropylbenzene/bromobenzene at Locations 3 and 6. No risk-based concentration (RBC) exists for either of these compounds, which could not be distinguished by the onsite laboratory instrumentation due to similar retention times.

Eight pesticides were detected in the three surface soil samples. The dieldrin concentration exceeded the industrial RBC and the soil screening level (SSL) in two samples and exceeded the residential RBC and the SSL in the third sample. However, dieldrin is ubiquitous to NSA Memphis due to its basewide aerial application during the 1950s and 1960s. Aldrin was detected above the SSL, but did not exceed its residential RBC.

Nineteen SVOCs were detected in the three surface soil samples. The concentration of benzo(a)pyrene exceeded the industrial RBC at one location, and exceeded the residential RBC at a second location. Benzo(a)anthracene exceeded both the residential RBC and the SSL at one location. Benzo(b)fluoranthene and dibenz(a,h)anthracene exceeded the residential RBC at one location, and chrysene exceeded the SSL at one location.

Sixteen metals were detected in the surface soil samples, most of which exceeded their background reference concentrations (RCs, or two times the mean background concentration) at NSA Memphis. Arsenic exceeded its RC, industrial RBC, and SSL at two locations. Beryllium was identified at concentrations above the residential RBC in most samples; however, the background RC of beryllium (0.96 milligrams per kilogram [mg/kg]) exceeds the residential RBC (0.15 mg/kg). No other metal exceeded its residential RBC. The SSL and the background RC were exceeded for barium at two sampling locations and for mercury at one location.

Sixteen metals were detected in the subsurface soil samples. Barium exceeded the SSL and the RC in one sample. Antimony and tin, which do not have SSLs, exceeded their RC in two subsurface soil samples each.

No VOCs were identified in groundwater by the onsite laboratory. Three groundwater samples were split and submitted to the offsite laboratory for confirmation analysis. The only VOCs identified in the split samples were acetone at two locations, toluene at one location, and carbon disulfide at one location. Acetone is a common laboratory artifact. No RBCs for tap water or maximum contaminant levels for drinking water were exceeded by VOCs detected in groundwater.

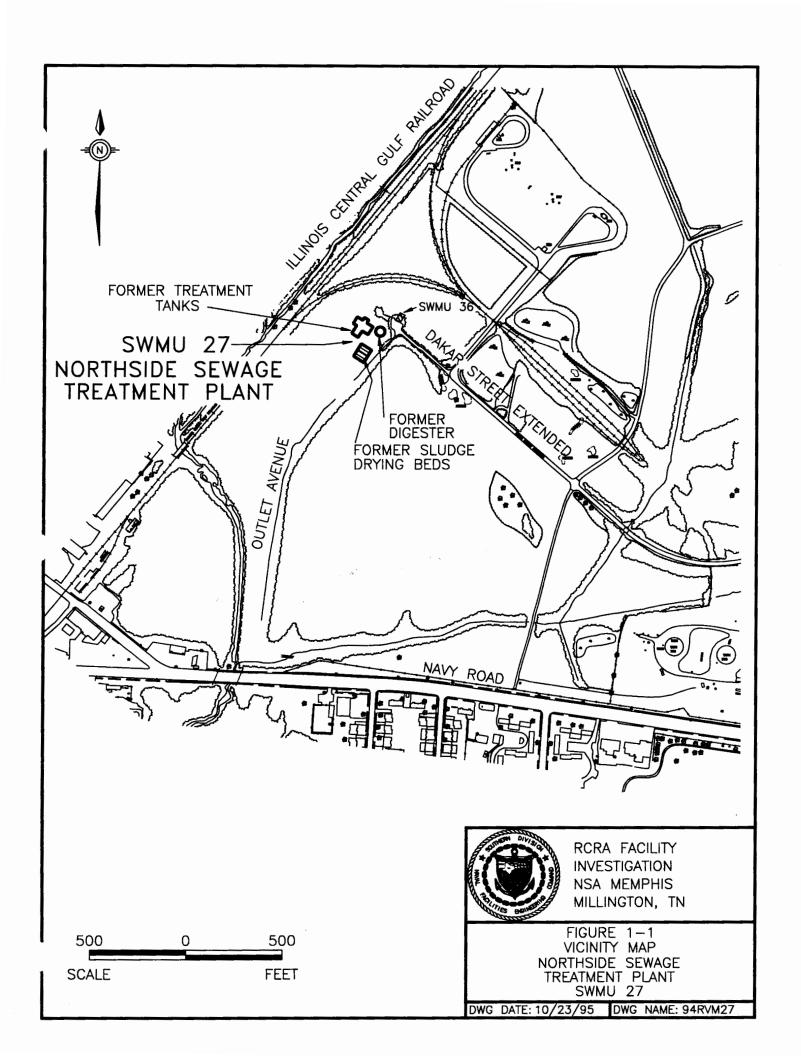
The PRE results indicate the property is suitable to lease for commercial land use. Based on the results of the first phase and the anticipated commercial land use of the property, no further action is recommended for SWMU 27.

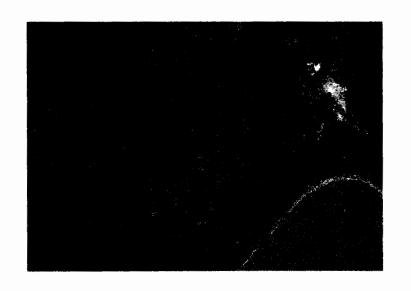
1.0 INTRODUCTION

As part of the U.S. Navy Installation Restoration Program, the following Confirmatory Sampling Investigation (CSI) report has been prepared for Solid Waste Management Unit (SWMU) 27, the Northside Sewage Treatment Plant, at Naval Support Activity (NSA) Memphis, Millington, Tennessee. Figures 1-1 and 1-2 provide a location map and aerial photograph, respectively, of SWMU 27.

As a result of the Base Closure and Realignment Act of 1990 (BRAC), a portion of NSA Memphis, which includes SWMU 27, will be closed and prepared for transfer to the City of Millington. Eight SWMU assemblies (i.e., groups) have been defined for the NSA Memphis Resource Conservation and Recovery Act (RCRA) Corrective Action Program. Four of these assemblies (A, B, C, and D) are on closing portions of the base and have been categorized and ranked according to their BRAC status. SWMU 27 is in Assembly C, which is composed of five SWMUs requiring CSIs to determine whether a release of contaminants has occurred and, if so, whether RCRA Facility Investigation (RFI) characterization will be required. The remaining four assemblies (E, F, G, and H) are on portions of the base that will remain open. The investigation, undertaken by EnSafe/Allen & Hoshall (E/A&H), adhered to the requirements of the Hazardous and Solid Waste Amendments portion (HSWA-TN002) of RCRA Permit No. TN2-170-022-600 and applicable regulations.

The Assembly C Site Investigation Plans (E/A&H, 1995) proposed two phases of investigation for the CSI at SWMU 27. The first phase consisted of a soil and groundwater investigation using a hand auger and truck-mounted Geoprobe equipment. Based on the results of the first phase, the second phase, consisting of installing and sampling soil borings and monitoring wells, is not required. The surface soil sample results were used to prepare a Preliminary Risk Evaluation (PRE). The PRE indicates the property is suitable to lease for commercial land use. This CSI report summarizes the activities conducted during the first phase of the CSI and provides conclusions, including a recommendation for no further action.





SWMU 27 BOUNDARY





150

300 Ft.





RCRA FACILITY INVESTIGATION
NSA MEMPHIS
MILLINGTON, TENNESSEE

FIGURE 1-2
DIGITAL ORTHOPHOTOGRAPH
NORTHSIDE SEWAGE TREATMENT PLANT
SWMU 27

AML: homel/orl/steveleb_d

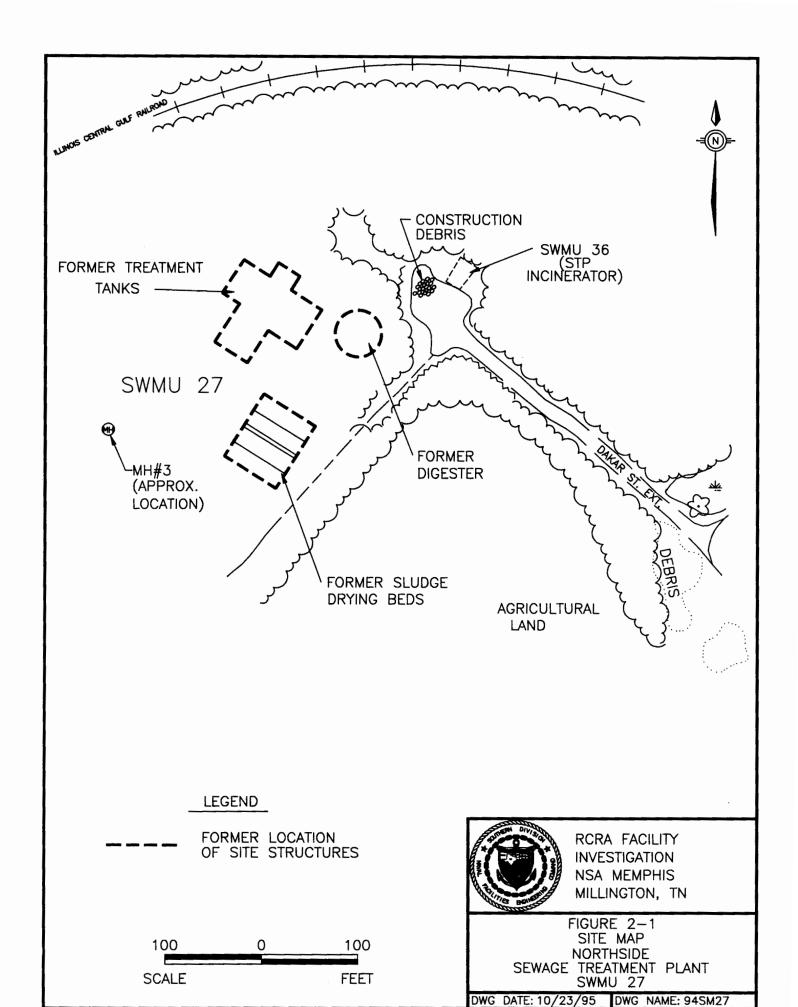
2.0 SITE DESCRIPTION AND HISTORICAL INFORMATION

2.1 Site Description

SWMU 27 is the site of a former sewage treatment plant (STP) at the southwest corner of the NSA Memphis Northside near Dakar Street Extended and Outlet Avenue. The STP was constructed in 1943 and included a digester tank (N-44), a control house, six treatment tanks (N-45) and four sludge drying beds (N-46). The STP is no longer in use, and site features have been demolished. There are conflicting dates as to when the STP was demolished — either in the mid-1970s or as late as 1984. There are also reports of the operations discontinuing between the late 1940s and early 1950s, suggesting less than 15 years of operation. Figure 2-1 shows the locations of the former site features.

The site exhibits extensive revegetation, both natural and anthropogenic, which, based on the maturity of the trees, is likely the result of about a 20-year period of regrowth. A visual site inspection (VSI) was conducted by E/A&H in January 1995, when most of the vegetation was dormant. Although a previous VSI conducted in April 1990 did not identify traces of the STP, sparse winter vegetation made a few remnants more visible.

A small piece of a reinforced concrete surface was observed beneath approximately 4 to 6 inches of soil and detritus in the area of the former digester, indicating some remnant foundations or structures may still exist beneath the topsoil. On the western side of the site, approximately 150 feet of a 3-foot wide, 6-inch thick concrete walkway was exposed in several areas. In one such area, the top of an open-ended, 12-inch-diameter iron pipe was visible crossing beneath the walk. The walk was oriented east-to-west near the north edge of N-45 and extended to the old Illinois Central Gulf Railroad tracks, oriented northeast-southwest along the western site boundary. Although still quite prominent, this feature was not identified on the STP construction plans, and its purpose is unknown.



A large, octagonal concrete manhole/cap identified on the 1942 STP plans as "M.H. #3" is approximately 120 feet west of the former sludge drying beds. This manhole reportedly provides access to an 18-inch sewer discharge pipe and contains a 15-inch automatic flood gate. The rest of the site is overgrown, dominated by rows of planted pine trees with mixed deciduous trees and a thick understory. The dirt roadway east of the STP is still maintained to allow for occasional access. Beneath an inch of topsoil and high grass, the gravel drive to the north of the STP is also present. No other STP features were apparent during the 1995 VSI.

Several small sink holes are in the wooded areas, some of which contain standing water. The old Illinois Central Gulf Railroad track is approximately 450 feet west of the site. A drainage ditch parallels the western side of the railroad track (see Figure 1-1). Surface water at the site drains west-southwest, crosses under the railroad track through a culvert, and flows into the drainage ditch, which conveys the water approximately 700 feet southwest of the culvert where it enters North Fork Creek. North Fork Creek, in turn, conveys water southward for approximately 4,500 feet to the Big Creek Drainage Canal, which parallels the south boundary of NSA Memphis.

2.2 Historical Site Operations

While in operation, the STP reportedly received mostly sanitary waste from the Northside of the base. There was, however, a period during the 1940s and 1950s in which some industrial wastes (oils, solvents, and paints) were reportedly discharged to the sewage system from various operations. Water was removed from sewage sludge by pumping it onto the four 20-foot by 55-foot drying beds. The drying beds consisted of a three-layer filter substrate, made up of 8 inches of sand, 6 inches of pea gravel, and a 10- to 13-inch layer of coarse aggregate. Within the aggregate layer was a system of 6-inch drain lines to transport percolated water. Drying bed diagrams indicate that each bed was open to undisturbed earth below the aggregate substrate. This interface is most likely the release point for STP contaminants, and this is the only treatment process at the site during which waste was likely to directly contact native soil.

3.0 PREVIOUS INVESTIGATIONS

Before the CSI, no investigations were performed at SWMU 27.

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4.0 FIELD INVESTIGATIONS AND METHODOLOGY

The CSI soil and groundwater sampling program was intended to determine if contaminants associated with past activities at SWMU 27 were present. Specifically, the CSI objectives were:

- Determine the potential for subsurface soil contamination in the loess as a result of sludge drying practices.
- Determine the potential for groundwater contamination in the surficial aquifer as a result of sludge drying practices.
- Determine the suitability of the property for leasing by preparing a PRE.

This section summarizes the soil and groundwater sampling tasks during the first phase of the CSI, which was conducted using a hand auger and Geoprobe sampling equipment. The field sampling activities followed the procedures outlined in the U.S. Environmental Protection Agency (USEPA)- and Tennessee Department of Environment and Conservation-approved Comprehensive RFI Work Plan (E/A&H, 1994) and Assembly C Site Investigation Plans (E/A&H, 1995).

A description of the sample locations and the rationale for sampled intervals are presented in Sections 4.1 and 4.2, respectively, of this CSI report. Section 4.3 presents the specific sampling protocols (sample processing, labeling, and chain-of-custody documentation).

Analytical Parameters

Nine surface soil samples, 18 subsurface soil samples, and six groundwater samples were collected during the CSI to determine the nature and extent of contamination by volatile organic compounds (VOCs), and metals associated with sludge drying practices at SWMU 27. In addition, three surface soil samples were also analyzed for chlorinated pesticides/polychlorinated

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biphenyls (PCBs) and semivolatile organic compounds (SVOCs). Hydrologic, Incorporated's

mobile onsite laboratory analyzed the soil and groundwater samples for VOCs using USEPA

Method 8021. Twenty-five percent of the soil and groundwater samples submitted to Hydrologic

for VOC analysis were split and submitted to the National Environmental Testing, Inc. (NET),

laboratory in Bedford, Massachusetts, for confirmation analysis by USEPA Method 8240. NET

analyzed the samples for pesticides/PCBs, SVOCs, and Appendix IX metals by the USEPA

Methods 8080, 8270, and the 6010/7000 series, respectively.

Hydrologic used a Level II-equivalent Data Quality Objective (DQO) for onsite sample analysis.

NET used a Level III-equivalent DQO for 95% of the samples and a Level IV-equivalent DQO

for 5% of the samples.

E/A&H validated the analytical results of the three surface soil samples analyzed for

pesticides/PCBs and SVOCs. Validata Chemical Services, Inc., of Norcross, Georgia, validated

the analytical results of the remaining NET samples. Attachment 1 contains the validation

report, which indicates that the overall data quality of the analytical work is satisfactory.

Hand-Auger Sampling Methods

E/A&H collected three surface soil samples for pesticide/PCB and SVOC analyses using a 3-inch

diameter, stainless-steel hand auger. The hand auger was advance from land surface to 1 foot

below land surface (bls) using a clockwise motion. The soil collected in the auger was placed

in a stainless-steel bowl for processing.

Geoprobe Sampling Methods

Tri-State Testing Services, Inc., (Tri-State), of Memphis, Tennessee, collected the soil and

groundwater samples using a truck-mounted hydraulically driven, Geoprobe sampling system.

Soil samples were obtained by advancing a 1-inch diameter soil probe to the desired sampling

depth. The 48-inch sampler, situated at the end of the probe, contained a "push point" which

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retracted when the sampling interval was reached. The sampler was then advanced through the sampling interval. The soil sample was then retrieved from the borehole and the collected material removed from the sampler. The samples were collected in a stainless-steel sampler lined with an acetate sleeve, which minimized sample handling and maintained sample integrity. Groundwater samples were obtained with a 1-inch diameter, stainless-steel groundwater sampler equipped with a 12-inch long, 0.010-inch slotted screen. The groundwater sampler was pushed to the selected sampling depth, retracted approximately 24 inches to open up the screen, and the void was allowed to fill. A piece of 0.25-inch diameter tubing was inserted into the screen assembly and attached to a transfer cap/bottle system. A vacuum was then placed on the transfer system, and the groundwater sample collected from the tubing after it was removed from the sampler.

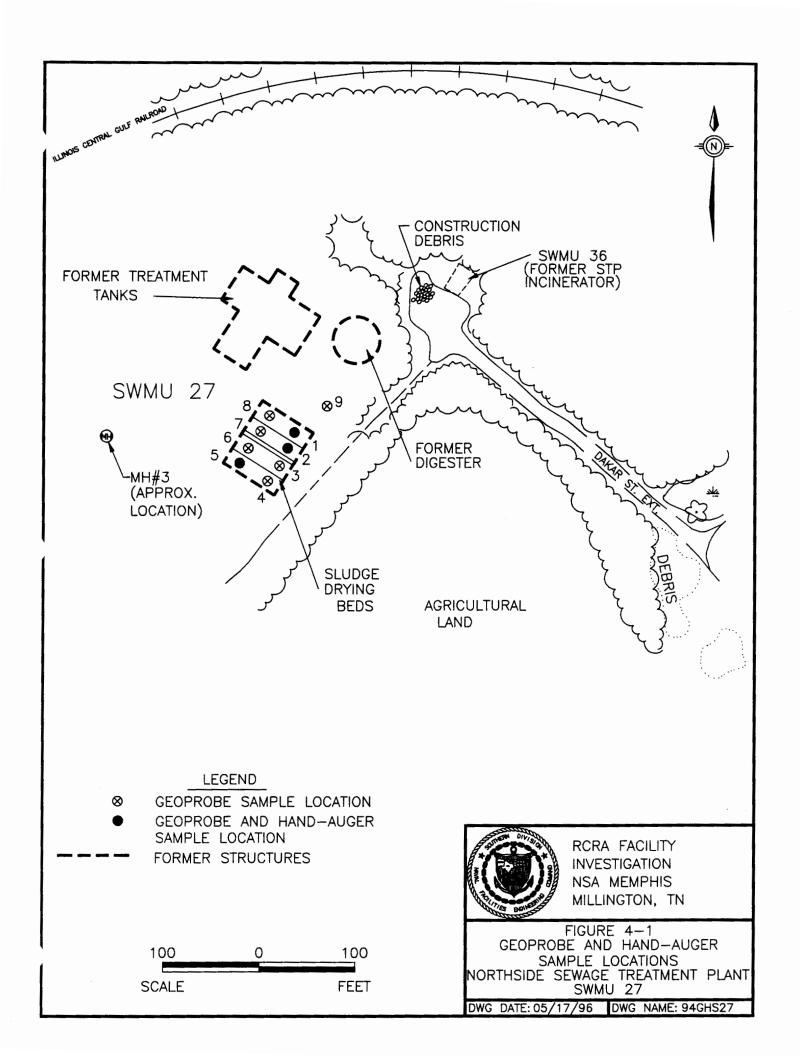
4.1 Investigation of Soil and Groundwater

Nine sampling locations were proposed in the Assembly C Site Investigation Plans to define the nature and extent of contamination, if any, associated with the former sludge drying beds. Two sampling locations were placed in each cell of the sludge drying beds (Locations 1 through 8), and one location (Location 9) was placed north of the sludge drying beds in a presumed upgradient position. Figure 4-1 shows the sampling locations.

4.2 Sampling Rationale and Methods

The Assembly C Site Investigation Plans (E/A&H, 1995) stated that the following four soil/and or groundwater samples would be collected from each Geoprobe location during the CSI:

- One surface soil sample (0 to 1 foot bls);
- One soil sample from the native soil just beneath the bottom layer of filter bed aggregate;
- One sample, either soil or groundwater, from the soil-water interface in the loess; and
- One groundwater sample from the top of the fluvial deposits.



To determine the intervals to be sampled, the first Geoprobe boring (Location 1) was sampled continuously to 14 feet bls. In this boring, native soil was encountered at 4 feet bls, the soil/water interface in the loess at 13 feet bls, and fluvial deposits groundwater at 44 feet bls. Native soil in subsequent borings was encountered at 5 feet bls, and the soil/water interface in the loess between 11 and 12 feet bls. No groundwater samples could be collected from the loess. Based on field observations, the following intervals were selected for CSI sampling.

- One surface soil sample (0 to 1 foot bls)
- One subsurface soil sample from the native soil just beneath the bottom layer of filter bed aggregate (5 to 6 feet bls)
- One subsurface soil sample from the soil/water interface in the loess (11 to 12 feet bls)
- One groundwater sample from the top of the fluvial deposits (44 feet bls)

Exceptions to the above sampling intervals occurred at Location 1, where soil samples were collected from the 4- to 5-foot and 13- to 14-foot intervals, based on field observations. No fluvial deposits groundwater samples were collected from Locations 3, 4, and 7 due to the insufficient volume of groundwater which entered the sampler. These deviations were recorded in the field logbook.

During the Geoprobe investigation, Quality Assurance/Quality Control (QA/QC) samples were collected to test the level of reproducibility attainable in the sampling and analytical processes. QA/QC samples were analyzed for VOCs as were the associated environmental samples. Soil and groundwater *duplicate* samples collected at a frequency of 25% during the investigation were submitted to the offsite laboratory (NET) for confirmation analysis. The analytical results of the duplicate samples are discussed in Section 6, Nature and Extent of Contamination.

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After reviewing the results of the Geoprobe investigation, three surface soil samples were proposed in the Assembly C Confirmatory Sampling Investigation Report (E/A&H, Revision 0, November 1995) to provide data needed to prepare a PRE. The samples were collected at Locations 1, 2, and 5 (refer to Figure 4-1) in the sludge drying beds. These locations were chosen based on the analytical results of the Geoprobe investigation (where USEPA residential or industrial risk-based concentrations [RBCs] for arsenic and beryllium had been exceeded in surface soil samples) and sampling accessibility.

An E/A&H geologist logged and processed the soil samples for submittal to the analytical laboratories. Tri-State collected the soil samples with the Geoprobe rig using the 1-inch diameter soil probe lined with an acetate sleeve. To minimize the potential loss of volatiles, soil samples for VOC analyses were placed in bottles immediately after collection. Soil samples for metals analyses were homogenized in a stainless-steel bowl in accordance with Section 4.2.10 of the Region IV USEPA Standard Operating Procedures/Quality Assurance Manual and containerized as outlined in Section 4.4.4 of the *Comprehensive RFI Work Plan*. Groundwater samples from the fluvial deposits were collected directly from the sampler and containerized in prepreserved vials. All samples were placed immediately on ice for transport to the onsite and offsite laboratories.

The sampling protocol adhered to the approved Comprehensive RFI Work Plan (E/A&H, 1994) and the Assembly C Site Investigation Plans (E/A&H, 1995). Sample handling was minimized. When transferring material from the sampling device to containers, the operation was conducted expediently, in as clean an environment as possible. A new pair of disposable gloves was donned before collecting each soil and groundwater sample. Empty containers were kept packaged until used, at which time they were immediately chilled and isolated in coolers.

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4.3 Sample Processing and Chain-of-Custody Procedure

All samples collected in the field were labeled with a 10-digit alphanumeric code that identifies the site, sample type, sample location, and interval. The first three digits identify the site location, and the fourth digit identifies the sample matrix (S = soil, G = groundwater). The next four digits identify the sampling location, and the last two digits are the deepest point of the sampling interval. For example, the sample label "027S000212" designates a SWMU 27 soil sample collected from Location 2 at a maximum depth of 12 feet.

Clean sample containers provided by the testing laboratory were shipped to E/A&H in sealed packages. Sample containers were labeled with the sample identification number, date, sampler's name, and requested analytical parameter, then placed in a cooler immediately following collection. Each sample was logged in the field logbook. Samples for offsite laboratory analysis were prepared for shipment by wrapping each container individually in bubble wrap, placing it in a resealable plastic bag, and packing it on ice inside a sturdy cooler. Cooler lids were secured with packing tape and sealed with signed custody seals. Packaged samples were then shipped overnight via FedEx priority service for next morning delivery. The offsite laboratory was notified the day of shipment of the number of samples submitted. All sample shipments were reported to have arrived at NET in good condition and at the appropriate temperature.

To ensure the integrity of the sample transfer process, a strict chain-of-custody procedure was implemented. The procedure, initiated in the field, was conducted through custody transfer to the analytical laboratory. A chain-of-custody form was completed for each batch of samples, itemizing sample numbers, containerization, preservatives, analyses requested, date and time of sampling, and FedEx shipping number. Custody transfers were recorded by signature, date, and time of relinquishment, and receipt of custody by the parties involved.

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4.4 **Grouting Procedure**

Tri-State filled each Geoprobe boring with neat cement grout following sample collection.

4.5 **Decontamination Procedures**

Tri-State decontaminated the downhole field equipment which did not come in contact with the

samples (i.e., rods, split-spoons) with a nonphosphate detergent and a deionized, organic-free

water rinse. All downhole equipment and sampling tools which could contact the collected

samples were decontaminated before and after each use in accordance with guidelines set forth

in the Assembly C Site Investigation Plans, which consisted of the following steps:

Wash with a hot soap and water mixture

Rinse with potable water

Rinse with deionized organic-free water

Rinse twice with pesticide-grade isopropyl alcohol

Rinse with deionized organic-free water

Wrap with aluminum foil or plastic

A new pair of disposable nitrile gloves was donned before handling decontaminated sampling

equipment. Surface and subsurface soil samples were collected directly from the hand auger or

the acetate sleeves within the stainless-steel sampler, and groundwater samples were collected

directly from the groundwater sampler. Therefore, no investigation-derived waste was generated

from these sampling activities.

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5.0 GEOLOGY AND HYDROGEOLOGY

5.1 Regional Geology and Hydrogeology

The general hydrogeology of the Memphis area is discussed in detail in Section 2.11 and a conceptual model of the hydrogeology at the NSA is presented in Section 2.12 of the Comprehensive RFI Work Plan (E/A&H, 1994). Updated information is available in the Hydrogeology of Post-Wilcox Group Stratigraphic Units in the Area of the Naval Air Station Memphis, Near Millington, Tennessee (Kingsbury and Carmichael, 1995), provided in Attachment 2 of this document. On the basis of this updated information, the hydrogeology of NSA Memphis is re-summarized below.

The two stratigraphic units investigated during the RFIs at NSA Memphis are the loess/alluvial deposits of Pleistocene and Holocene age and the underlying fluvial deposits of Pleistocene to Pliocene age. The loess — eolian deposits consisting of silt, silty clay, clay, and minor amounts of sand — is the principal unit occurring at land surface throughout the NSA Memphis Northside. Alluvium, which is restricted to stream valleys, includes alluviated or reworked loess. The loess is typically 0 to 65 feet thick in the Memphis area; at NSA Memphis it ranges from 15 to 45 feet thick. Water-bearing zones are present in the loess primarily in the upper part of this unit; however, yields are low and water quality analyses performed during the water use survey portion of previous underground storage tank investigations indicate that loess groundwater does not meet many primary and secondary drinking water standards. Previous investigations at NSA Memphis have found depth to water in the loess varying between 5 and 15 feet bls and vertical hydraulic conductivities to range from 10-6 to 10-8 centimeters per second (cm/sec). Although the loess may be considered an aquitard on the basis of the relatively low hydraulic conductivities, this shallowest water-bearing zone is present within this interval. Groundwater flow in the loess is primarily downward, although locally some groundwater in the loess may discharge to nearby streams, drainage ditches, and other surface water bodies.

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The fluvial deposits underlie the loess in upland areas and consist of sand, gravel, and some

clay, with thin layers of ferruginous sandstone and conglomerate at the base. This unit ranges

from 0 to 100 feet thick in the Memphis area; on the Northside of NSA Memphis it ranges from

10 to 60 feet thick and represents the most significant component of the surficial aquifer. Many

shallow domestic wells in the Memphis rural areas are completed in the fluvial deposits.

Relative groundwater elevations between wells completed in the loess/alluvium and fluvial

deposits indicate semiconfined to confined conditions in the fluvial deposits. Typically a

downward vertical gradient exists between water in the loess and the fluvial deposits. Sediments

in the fluvial deposits generally coarsen with depth, and typically, the upper portion consists of

a mixture of very fine sand with varying degrees of silt and clay and becomes increasingly less

silty with depth, grading into a fine to medium sand near the middle of the unit. Grain sizes

typically coarsen below this interval, grading into a gravelly sand near the fluvial deposits basal

section.

The fluvial deposits are underlain by the Cockfield Formation, a part of the Jackson-upper

Claiborne confining unit, which is a heterogeneous formation consisting of very fine silty sand

interbedded with clay and silt lenses or clay with interbedded fine sand lenses. The Cockfield

Formation ranges in thickness from approximately 35 to 180 feet in the NSA Memphis area.

The more-permeable characteristics of the fluvial deposits, compared to the relatively

impermeable properties of the overlying loess/alluvium and the underlying Jackson-upper

Claiborne confining unit, result in the fluvial deposits being the preferential zone of groundwater

flow and the route for contaminant transport in NSA Memphis's subsurface.

5.2 Site-Specific Geology and Hydrogeology

The following sections provide site-specific geologic and hydrogeologic information obtained

from stratigraphic test borings, the Assembly A SWMU 60 RFI investigation, and the SWMU 27

Geoprobe investigation.

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USGS Stratigraphic Test Boring

In 1994, the U.S. Geological Survey drilled the 200-foot deep stratigraphic test hole 4 approximately 500 feet south of the main runway and about 2,100 feet northeast of SWMU 27. Attachment 2 of this document contains a copy of the previously referenced Kingsbury and Carmichael publication, which provides a geologic cross-section showing test hole 4 (USGS designation Sh:U-99). The test hole was originally to be advanced approximately 15 feet into the Cook Mountain Formation (the confining unit separating the Memphis aquifer from the overlying Cockfield Formation and shallower units). However, due to the unanticipated thinness of the Cockfield Formation, this borehole was advanced approximately 50 feet into the Memphis Sand. Cuttings from the test hole were visually logged by a field geologist during drilling, and geophysical logs were run following completion of the hole. Lithologies encountered in the test hole were as follows:

Loess: Approximately 40 feet of wind-blown silt deposits (loess)

consisting of silt and clay.

Fluvial Deposits: Approximately 30 feet of fluvial deposits consisting of sand

and gravel.

Cockfield Formation: Approximately 35 feet of alternating sand, clay, and some

lignite.

Cook Mountain Formation: The Cook Mountain, characterized as a brownish-gray to

olive-gray dense clay approximately 50 feet thick, is defined as the upper confining unit between the surficial

aquifers and the Memphis Sand aquifer.

SWMU 60 RFI

Shallow subsurface soil and groundwater information was collected while implementing the Assembly A RFI at SWMU 60, the Northside Landfill, approximately 500 feet east of SWMU 27. During the RFI, six soil borings were advanced and sampled, and 10 groundwater monitoring wells were installed, six in the loess and four in the lower fluvial deposits at various

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locations just outside the landfill's perimeter. Attachment 2 contains a copy of the soil boring/monitoring well logs for the SWMU 60 RFI. The SWMU 60 RFI report is currently being prepared by E/A&H and will be submitted in final form later. Based on the information provided by the soil borings, silt and clay (loess) is present from ground surface to a depth of between 39 and 45 feet. Groundwater was first encountered in the loess at approximately 9 to 10 feet bls in all borings but was found to equilibrate within 3 or 4 feet of the surface in the completed wells, indicating confined groundwater conditions. A Shelby tube was collected from boring 60S0003 at the 20- to 22-foot depth interval. Geotechnical analysis of the sample indicated a vertical hydraulic conductivity of 1.7 x 10-7 cm/sec for the loess at this location. Grain-size analysis indicated a silty clay classification.

The top of the fluvial deposits contained silty sand and sand with alternating layers of sandy gravel and clay lenses. Gravel content typically increased with depth, as well as the sand grain-size distribution, which generally was fine in the upper part and coarse in the lower part. The base of the fluvial deposits/top of the Cockfield Formation was found to range between 75 and 96 feet bls. The top of the Cockfield was characterized by a grayish brown to pale brown clayey silt with a fine micaceous sand.

A specific capacity of 0.91 gallons per minute per foot of drawdown was calculated during a pump test of well 60MW04LF (approximately 800 feet southeast of SWMU 27), screened in the lower fluvial deposits. Using this specific capacity and an aquifer thickness of 55 feet at this location, a hydraulic conductivity of approximately 15 feet per day (ft/day) was determined. Horizontal groundwater velocities in the lower fluvial deposits have been estimated from SWMU 60's specific capacity data to range from 0.085 to 0.16 ft/day while the horizontal groundwater velocity in the loess at the Aviation Fire Fighting Training Facility (SWMU 5) approximately 3,000 feet southeast of SWMU 27, was estimated to be approximately 0.0014 ft/day (or 0.5 feet per year) (E/A&H, 1992).

Groundwater elevations were measured in SWMU 60 monitoring wells on March 31 and September 6, 1995. On these dates, the groundwater flow direction in the loess was south-southeast with a horizontal gradient ranging from 0.013 to 0.034 feet/foot. Groundwater in the lower part of the fluvial deposits flowed northwest with a relatively flat gradient ranging between 0.0016 to 0.003 feet/foot. Relative groundwater elevations between wells screened in the loess and fluvial deposits indicated a downward gradient from the loess to the fluvial deposits.

SWMU 27 CSI

During the Geoprobe investigation, E/A&H collected soil samples continuously to 14 feet bls at Location 1 for visual observation and lithologic description. The field geologist described the lithology encountered during the Geoprobe investigation as brown silty clay and clay (loess). The water-bearing zone in the loess (11 to 13 feet bls) was visually classified as a silty clay. Groundwater was encountered at 44 feet in the upper part of the fluvial deposits.

6.0 NATURE AND EXTENT OF CONTAMINATION

This section provides the analytical results for surface soil (0 to 1 foot bls), subsurface soil (> 1 foot bls), and groundwater samples collected during the CSI. As outlined in Section 4, E/A&H collected surface and subsurface soil samples from three intervals at each of the nine sampling locations shown on Figure 4-1. Each of the samples were analyzed for VOCs and Appendix IX metals. Additional surface soil collected at three of the nine sampling locations was analyzed for SVOCs and pesticides/PCBs. Six groundwater samples were collected from the upper part of the fluvial deposits. Hydrologic's onsite laboratory analyzed the soil and groundwater samples for VOCs, and NET analyzed the soil samples for SVOCs, pesticides/PCBs, and Appendix IX Metals.

Detected concentrations of organic compounds and metals have been compared with media-specific guidance concentrations from the USEPA Region III RBC Table (July to December 1995) to evaluate the risk associated with exposure to soil and groundwater contaminants and to evaluate the transfer potential of contaminants from soil to groundwater. In addition, metals concentrations for the soil samples are compared with established reference concentrations (RCs) derived from background samples at NSA Memphis to determine if they represent naturally occurring concentrations. Background RC calculations were provided in the *Technical Memorandum* — *Assemblies A through D Background Reference Concentrations*, E/A&H, September 18, 1996). Detected concentrations of VOCs in groundwater are compared with RBCs for tap water (USEPA Region III RBC Table, July to December 1995) and maximum contaminant levels (MCLs) for drinking water (USEPA Drinking Water Regulations and Health Advisories, May 1995).

Specifically, surface soil sample results are compared with RCs, residential and industrial RBCs, and soil screening values (SSLs); whereas subsurface soil sample results are compared with RCs and SSLs only. Groundwater samples are compared with RBCs for tap water and MCLs for drinking water.

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Section 6.1 briefly discusses the criteria used to determine the RCs (two times the mean

background concentration) for metals. Section 6.2 summarizes the detected contaminants in

surface and subsurface soil. Contaminants identified in surface soil are further evaluated in the

Preliminary Risk Evaluation (Section 7). Section 6.3 summarizes the detected contaminants in

groundwater. Soil and groundwater contaminants detected at SWMU 27 are summarized in

Section 6.4.

6.1 Background Reference Concentrations

Background locations were established at five areas at NSA Memphis (shown on Figure 6-1) to

determine ambient soil and groundwater quality conditions. Background data for soil consist of

12 samples collected from five boring locations. The background RC for each metal was

calculated by doubling the mean concentration detected. Two RCs were established for soil —

one for surface soil (0 to 1 foot bls) and one for subsurface soil (> 1 foot bls). Tables 6-1

and 6-2 show the RCs for metals detected in surface and subsurface soil, respectively.

6.2 Soil Sample Analytical Results

The following sections summarize the results of soil samples collected during the CSI.

Appendix A contains the analytical data.

6.2.1 Surface Soil Samples

E/A&H collected nine surface soil samples from the 0 to 1 foot bls. Each sample was analyzed

for VOCs and Appendix IX metals. Three of the samples were also analyzed for

pesticides/PCBs and SVOCs. Figure 4-1 shows the sampling locations, and Table 6-1

summarizes the detected contaminant concentrations.

6-2

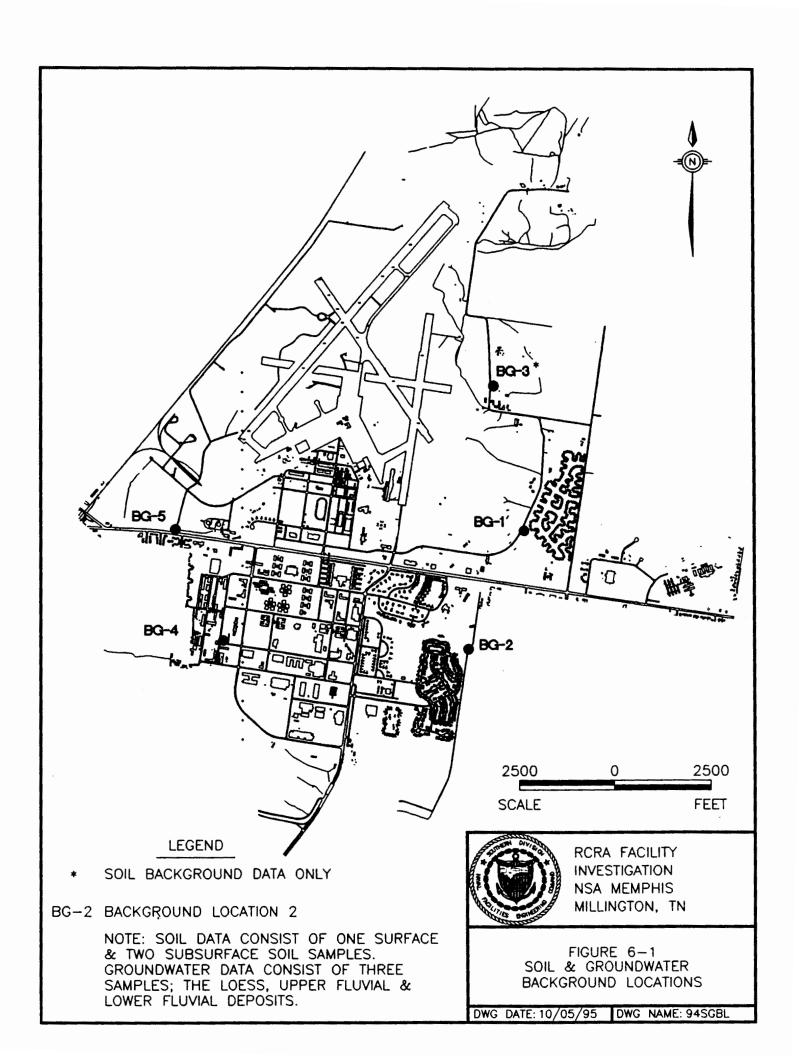


Table 6-1
Detected Concentrations of VOCs, Pesticides, SVOCs, and Metals in Surface Soil
SWMU 27 — Northside Sewage Treatment Plant
(data in milligrams per kilogram)

		(data in milligrams per kilogram)							
Analyte	1 (0 - 1') 027S000101	2 (0 - 1) 027S000201	3 (0 - 1) 027S000301	4 (0 - 1') 027S000401	5 (0 - 1') 027S000501	RC• 0 - 1'	SSL	RBC ^c Residential	RBC ^c Industrial
			Organ	c Compounds					
Isopropylbenzene/ Bromobenzene4	ND•	ND	0.0058	ND	ND		_	-	-
Aldrin	ND	0.0097 J	N/Aª	N/A	ND	_	0.005	0.038	0.34
Heptachlor epoxide	0.0032 J	0.019	N/A	N/A	0.006 J		0.03	0.07	0.63
Dieldrin	0.2 D	1.2 D	N/A	N/A	0.71 D		0.001	0.04	0.36
Endrin	ND	0.0081 J	N/A	N/A	0.0045		0,4	23	610
4,4'-DDD	ND	ND	N/A	N/A	0.0026		0.7	2.7	24
4,4'-DDT	0.0071 J	0.019 J	N/A	N/A	0.014 J	**** <u></u> **	1	1.9	17
alpha-Chlordane	0.019	0.12 D	N/A	N/A	ND		2	0.49	4.4
gamma-Chlordane	0.0081	ND	N/A	N/A	ND	-	2	0.49	4.4
Technical chlordane	0.11	0.67	N/A	N/A	ND	-	2	0.49	4.4
Naphthalene	ND	0,25 J	N/A	N/A	ND		30	3,100	82,000
2-Methylnaphthalene	ND	0.063 J	N/A	N/A	ND		304	3,100	82,000
Acenaphthylene	ND	0.043 J	N/A	N/A	0.045 J	-	200×	4,700*	120,000*
Acenaphthene	ND	0.3 J	N/A	N/A	ND	_	200	4,700	120,000
Dibenzofuran	ND	0.24 J	N/A	N/A	ND:		120	310	8,200
Fluorene	ND	0.38 J	N/A	N/A	ND	_	160	3100	82000
Phenanthrene	ND	3	N/A	N/A	0.36 J		1,400	2,3004	61,0004
Anthracene	ND	0.64	N/A	N/A	0.0 9 4 J	-	4,300	23,000	610,000
Carbazole	ND	0.6	N/A	N/A	0.04 J		0.5	32	290
Fluoranthene	0.079 J	2.9	N/A	N/A	0.63		980	3,100	82,000
Pyrene	0.07 9 J	2.4	N/A	N/A	0.56		1,400	2,300	61,000
Benzo(a)anthracene	0.041 J	1.4	N/A	N/A	0.32 J	_	0.7	0.88	7.8
Chrysene	0.05 J	1.3	N/A	N/A	0.31 J		1	88	780
Benzo(b)fluoranthene	0.05 J	1.2	N/A	N/A	0.33 J	_	4	0.88	7.8
Benzo(k)fluoranthene	0.05 J	0.89	N/A	N/A	0.28 J		4	8.8	78
Benzo(a)pyrene	0.051 J	1.1	N/A	N/A	0.29 J		4	0.088	0.78
Indeno(1,2,3-cd)pyrene	ND	0.52	N/A	N/A	0.14 J	- 100 <u>- 1</u> 00	35	0.88	7.8
Dibenz(a,h)anthracene	ND	0.23 J	N/A	N/A	0.043 J		11	0.088	0.78
Benzo(g,h,i)perylene	0.041 J	0.53	N/A	N/A	0.16 J	- 10 10 10	1,400	2,300	61,000
				Metals					
Antimony	19,1 J	18.5 J	ND	ND	NĐ	ND	-	31	820
Arsenic	33 J	15.9 J	4.9	ND	9.4	13.2	15	0.43	3.8
Berium	153 J	109 J	111	225	202	191	32	5,500	140,000
Beryllium	1.2 J	0.97 J	0.83 J	0.68 J	0.45 J	0.96	180	0.15	1.3
Cadmium	1,3 J	ND	0.97 J	1.6	0.82 J	ND	6	39	1,000
Chromium	9 J	5.5 J	8.6	17	11.2	26.4	19	390	10,000
Cobalt	ND	ND	3.2 J	5.8 J	8.3	20.6		4,700	120,000
Copper	13.5 J	14.3 J	17.6	38.4	23.5	27		3,100	82,000
Lead	40.4	22.9	40.9	60.5	43.7	28.7	None*	None*	None*
Mercury	1.6	0.3	1.2	1.7	0.75	2.3	3	23	610
Nickel	ND	ND	9.1 J	11 J	18.7	ND	21	1,600	41,000
Selenium	0.48 J	ND	ND	ND	ND	ND	99946999466 3	390	10,000
Silver	6.6 J	ND	ND	8.4 J	2.3 J	ND		390	10,000
Vanadium	9.7 J	12.7 J	11.1 J	17.7	15.4	49.6	8, 08881 <u>9108</u> 81 M.S	550	14,000
Zinc	178	69.7	155	239	138	88.3	42,000	23,000	610,000
Tin	12.1 J	5.5 J	ND	22.1 J	ND	ND		47,000	1,000,000

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Assembly C — SWMU 27, Northside Sewage Treatment Plant

NSA Memphis, Millington, Tennessee

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Table 6-1 Detected Concentrations of VOCs, Pesticides, SVOCs, and Metals in Surface Soil SWMU 27 — Northside Sewage Treatment Plant (data in milligrams per kilogram)

Analyte	6 (0 - 1') 027S000601	7 (0 - 1') 027S000701	8 (0 - 1') 027S000801	9 (0 - 1') 027S000901	RC• 0 - 1'	SSL	RBC ^c Residential	RBC ^c Industrial
			Organi	c Compounds				
Isopropylbenzene/ Bromobenzenes	ND	ND	ND	ND		-		
				Metals				
Anumony	UN	ND	ND	ND	NIE		31	820
Arsenic	7.7	4	10.6	11.2	13.2	15	0.43	3.8
Bartum	120	148	110	52.7	. 191	32	5,500	140,000
Beryllium	0.65 J	ND	0.41 J	0.33 J	0.96	180	0.15	1.3
Cadmium	ND	0.97	ND	1.1 J	ND	6	39	1,000
Chromium	16.4	6.7	12.8	9.7	26.4	19	390	10,000
Cobalt	6.6 J	ND	7.9 J	5.4 J	20.6		4,700	120,000
Copper	11	38.3	8.8	11.3	27		3,100	82,000
Lead	30.6	277	24.7	10.2	28.7	None*	None*	None*
Mercury	0.25	3. <i>1</i>	0.13	ND	2.3	3	23	610
Nickel	14.9	ND	14.8	10.2	ND	21	1,600	41,000
Selenium	ND	ND	ND	0.5 J	ND	3	390	10,000
Silver	ND	15.8 J	ND	ND	ND		390	10,000
Vanadium	19.1	2.8 J	18.3	26.1	49.6		550	14,000
Zinc	86.8	163	49.1	31.6	88.3	42,000	23,000	610,000
Tin	ND	ND	ND	ND	ND		47,000	1,000,000

Notes:

- Reference concentration (2 x the mean background concentration). Background concentrations were established for the 0 to 1-foot and the greater than 1-foot intervals below land surface using analytical data from 12 soil samples collected from five background soil boring locations at various locations on the Northside and Southside of NSA Memphis (Technical Memorandum Assemblies A through D Background Reference Concentrations, E/A&H, September 18, 1996).
- b SSL = Soil Screening Level; RBC = Risk-Based Concentration. Values obtained from the USEPA Region III RBC Table, July to December 1995.
- RBC = Risk-Based Concentration; obtained from the USEPA Region III Risk-Based Concentration Table, July to December 1995.
- The onsite laboratory instrumentation could not distinguish between these two VOCs due to similar retention times for these compounds.
- ND = denotes analyte was not detected.
- No guidance concentration exists for this analyte.
- g J = denotes concentration is estimated.
- N/A = denotes sample was not analyzed for this parameter.
- D = indicates sample was diluted prior to analysis.
 - No RBCs exist for 2-methylnaphthalene; the RBCs for naphthalene were used as surrogates.
- No RBCs exist for acenaphthylene; the RBCs for acenaphthene were used as surrogates.
- No RBCs exist for phenanthrene and benzo(g,h,i)perylene; the RBCs for pyrene were used as surrogates.
- Although no there is no published SSL or RBC for lead, USEPA has published a recommended soil screening concentration of 400 milligrams per kilogram (mg/kg) for residential land use and 1,000 mg/kg for industrial land use (Office of Solid Waste and Emergency Response Directive 9355.4-12).

Bold indicates analyte exceeds the RC.

Italics indicates analyte exceeds the soil screening level.

Bold and Italics indicates analyte exceeds both the RC and the SSL.

LARGE PRINT indicates analyte exceeds the residential RBC.

LARGE PRINT AND BOLD indicates analyte exceeds both the RC and the residential RBC.

Table 6-2

Detected Concentrations of VOCs and Metals in Subsurface Soil

SWMU 27 — Northside Sewage Treatment Plant

(data in milligrams per kilogram)

1 (4 - 5') 1 (12 - 14') 2 (5 - 6') 2 (11 - 12') 3 (5 - 6') 3 (11 - 12') 4 (5 - 6') 4 (11 - 12') 5 (5 - 6') RC*

Applyte 0275000105 0275000114 0275000206 0275000212 0275000312 0275000406 0275000412 0275000412 0275000506 > 1'

Analyte	027S000105	027S000114	027S000206	027S000212	027S000306	027S000312	027S000406	027S000412	027S000506	> 1'	SSL
					Orga	nic Compound	S				
Isopropylbenzene/ Bromobenzene	ND ⁴	ND	ND	ND	ND	ND	ND	ND	ND	•	-
						Metals					
Antimony	20.4 J	ND	18 J	ND	ND	ND	ND	ND	ND	ND	
Arsenic	11.9 J	6.4 J	13.2 J	5.3 J	6.3	10.6	10.3	10	5.6	20.4	15
Barium	160 J	72.9 J	191 J	73.8 J	197	131	163	100	121	289	32
Beryllium	0.42 J	0.34 J	0.54 J	0.33 J	0.61 J	0.46 J	0.46 J	0.41 J	0.34 J	1.02	180
Cadmium	2.6 J	2.2 3	2.4 J	1.3 J	ND	ND	ND	ND	ND	6.8	6
Chromium	9.4 J	6.4 J	10.3 J	7.4 J	14.3	13.8	11.6	10.8 J	9.9	28.6	19
Cobalt	8.1 J	7.4 J	11.9 J	8 J	11.7 J	7.2 J	10 J	8.7 J	6.1 J	15.3	
Copper	17.5 J	12.7 J	18 J	16.1 J	10	12.4	11.7	12.9	7.1	33.9	
Lead	12.6	8.5	14.5	10.7	7.7	11.9	11.6	11.7	7	25.1	Nones
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.38	3
Nickel	20.8 J	15.1 J	26.3 J	16.5 J	22.7	24	28.1	20.1	14.9	59.8	21
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Vanadium	19.9 J	14.6 J	22.5 J	15.6 J	20.8	24.6	18.8	17.3	14.4	46.3	
Zinc	54.2	39.9	60.8	51.i	47.1	57	54.5	53.1	39.5	111.8	42000
Tin	ND	5.5 J	4.4 J	ND	ND	ND	ND	ND	ND	ND	** 116 10 106 10601000000000000000000000

Table 6-2

Detected Concentrations of VOCs and Metals in Subsurface Soil

SWMU 27 — Northside Sewage Treatment Plant

(data in milligrams per kilogram)

Analyte	5 (11 - 12') 027S000512	6 (5 - 6') 027S000606	6 (11 -12') 027S000612	7 (5 - 6') 027S000706	7 (11 - 12') 027S000712	8 (5 - 6') 027S000806	8 (11 - 12') 027S000812	9 (5 - 6') 027S000906	9 (11 - 12') 027S000912	RC* > 1'	SSL ^b
7 Annalyte	27.5000512	027500000	0275000012	0275000700		nic Compound		0275000700	0275000712		- COL
Isopropylbenzene/ Bromobenzene	ND	0.0411	ND	ND	ND	ND	ND	ND	ND		_
						Metals					
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	_
Arsenic	5.1	8.9	5.1	7	8.7	14.2	9.2	13.7	7.9	20.4	15
Barium	115	294	110	167	151	138	77.8	134	60.1	289	32
Beryllium	0.4 J	0.59 J	0.39 J	0.46 J	0.38 J	0.44 J	0.3 J	0.47 J	0.28 J	1.02	180
Cadmium	ND	ND	ND	ND	ND	ND	0.99 J	1.9 J	ND	6.8	6
Chromium	15	16.7	13.4	15	13.5	10.2	6.7 J	10	4.9 J	28.6	19
Cobalt	5.1 J	8.7 J	4.2 J	73	7.6 J	9.3 J	6.5 J	7.1 J	5.7 J	15.3	· ·
Copper	7.9	13.1	8.6	7.7	7.4	11.8	12.9	18.1	13.2	33.9	
Lead	7.8	9,4	6.1	7.8	10.6	14.5	9.4	13	9	25.1	Nones .
Mercury	ND	ND	ND	ND	0.11	ND	ND	ND	ND	0.38	3
Nickel	14.9	33.1	14.4	19.6	19.4	21.8	23.2	26.6	17.5	59.8	21
Selenium	ND	ND	ND	ND	ND	ND	0.53 J	ND	0.53 J	ND	3
Silver	ND	ND	ND	ND	ND	ND	ND	ND	0.97 J	ND	
Vanadium	17.5	30	12.9	23.5	19.8	17.2	12.5 J	18.9	13.1	46.3	—
Zinc	45.9	73.4	55,5	45.4	58.5	89.2 J	40	59	38	111.8	42000
Tin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-

Notes:

- RC = Reference concentration (2 x the mean background concentration). Background concentrations were established for the 0 to 1-foot interval and the greater than 1-foot intervals below land surface using analytical data from 12 soil samples collected from five background soil boring locations at various locations on the Northside and Southside of NSA Memphis (Technical Memorandum Assemblies A through D Background Reference Concentrations, E/A&H, September 18, 1996).
- SSL = Soil Screening Level; obtained from the USEPA Region III RBC Table, July to December, 1995.
- The onsite laboratory instrumentation could not distinguish between these two VOCs due to similar retention times for these compounds.
- d ND = denotes analyte was not detected.
- · = No guidance concentration exists for this analyte.
- t J = denotes concentration is estimated.
- Although no there is no published SSL for lead, USEPA has published a recommended soil screening concentration of 400 milligrams per kilogram (mg/kg) for residential land use and 1,000 mg/kg for industrial land use (Office of Solid Waste and Emergency Response Directive 9355.4-12).

Bold indicates analyte exceeds the RC.

Italics indicates analyte exceeds the SSL.

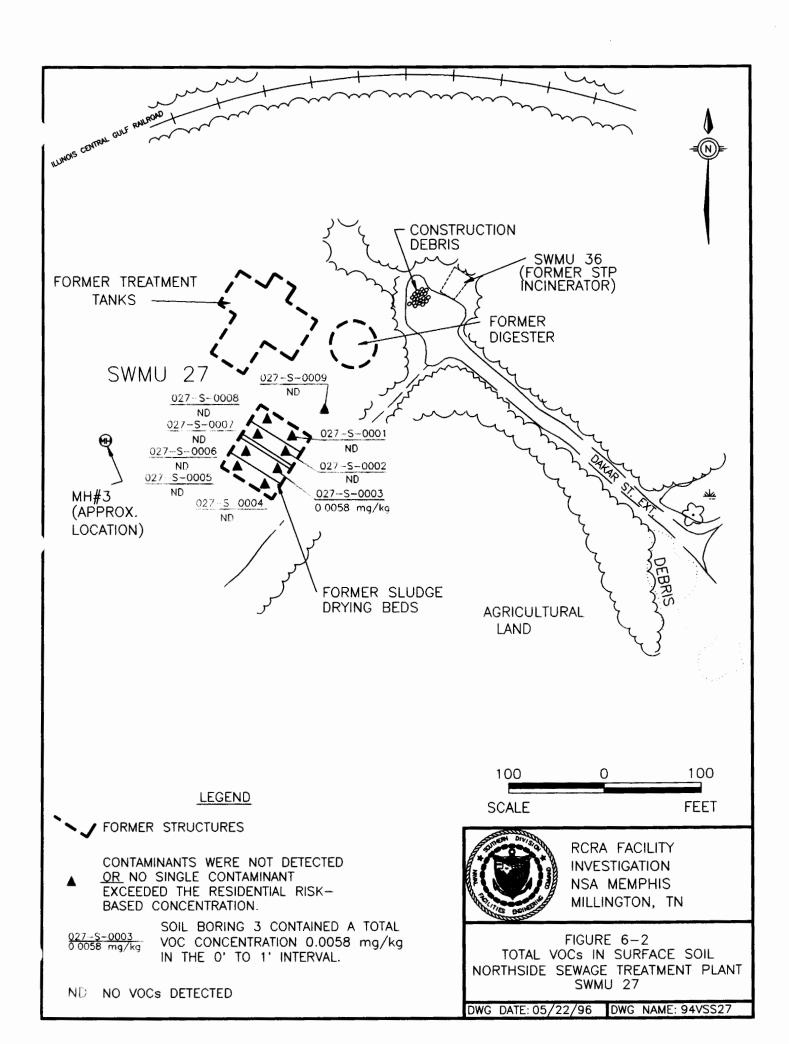
Bold and Italics indicates analyte exceeds both the RC and the SSL.

VOCs

The only VOCs detected in surface soil were isopropylbenzene/bromobenzene at Location 3 (0.0058 milligrams per kilogram [mg/kg]). These two compounds could not be distinguished by the onsite laboratory instrumentation due to similar retention times. No RC, SSL, or RBC exists for either of these compounds. Figure 6-2 provides a plot of total VOC concentrations in surface soil, and Table 6-1 summarizes the detected concentrations.

Pesticides/PCBs

Eight pesticides were detected in the three surface soil samples. Dieldrin was detected in all three surface soil samples at concentrations ranging from 0.2 mg/kg to 1.2 mg/kg, which exceeds the industrial RBC and the SSL. The June 2, 1995, Technical Memorandum Discussion of Dieldrin Risk Management Issues (E/A&H, 1995) provides the results of a background study for dieldrin concentrations at NSA Memphis. A copy of this technical memorandum is provided in Attachment 3. As outlined in the technical memorandum, dieldrin is ubiquitous to NSA Memphis due to its basewide aerial application during the 1950s and 1960s to control the spread of white-fringed beetles. The average background concentration of dieldrin in soil was 0.131 mg/kg, with a maximum detected concentration of 0.311 mg/kg. Risk estimates based on the background soil dieldrin concentrations at NSA Memphis did not exceed the 1E-4 Incremental Lifetime Excess Cancer Risk (ILCR) threshold established by the USEPA. As stated in the memorandum, "This finding indicates that dieldrin levels found at each SWMU do not necessitate remedial action in the absence of other significant carcinogenic risk contributors." In addition, because of the chemical properties of dieldrin and the physical properties of soil, it is not expected to leach in appreciable quantities (if at all) into underlying groundwater. Although the maximum detected dieldrin concentration at SWMU 27 (1.2 mg/kg) exceeds the average background concentration of 0.131 mg/kg, the risk ratio outlined in the PRE in Section 7 (3E-5 for residential carcinogens and 3.3E-6 for industrial carcinogens) still does not exceed the 1E-4 ILCR standard.



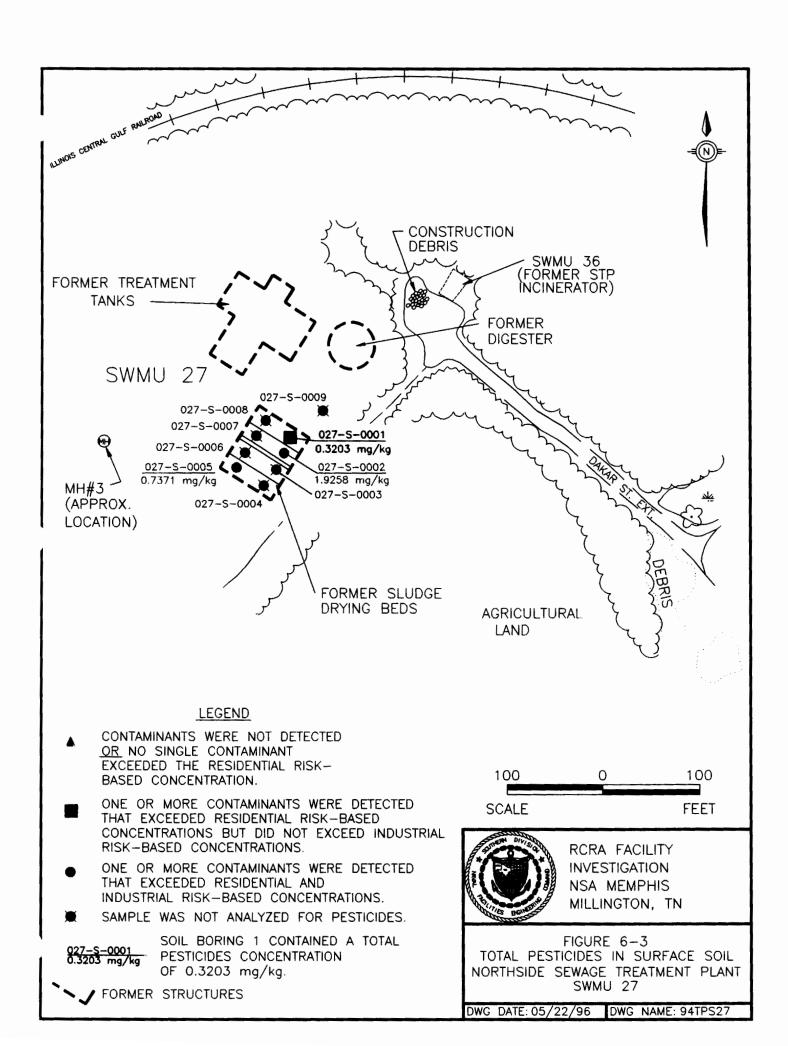
Aldrin was detected above the SSL, but did not exceed residential or industrial RBCs. No other detected pesticide exceeded RBCs or SSLs. No PCBs were detected in the surface soil samples. Figure 6-3 provides a plot of total pesticides concentrations in surface soil and indicates whether industrial and residential RBCs for individual pesticides are exceeded at each location. Table 6-1 lists each detected concentration.

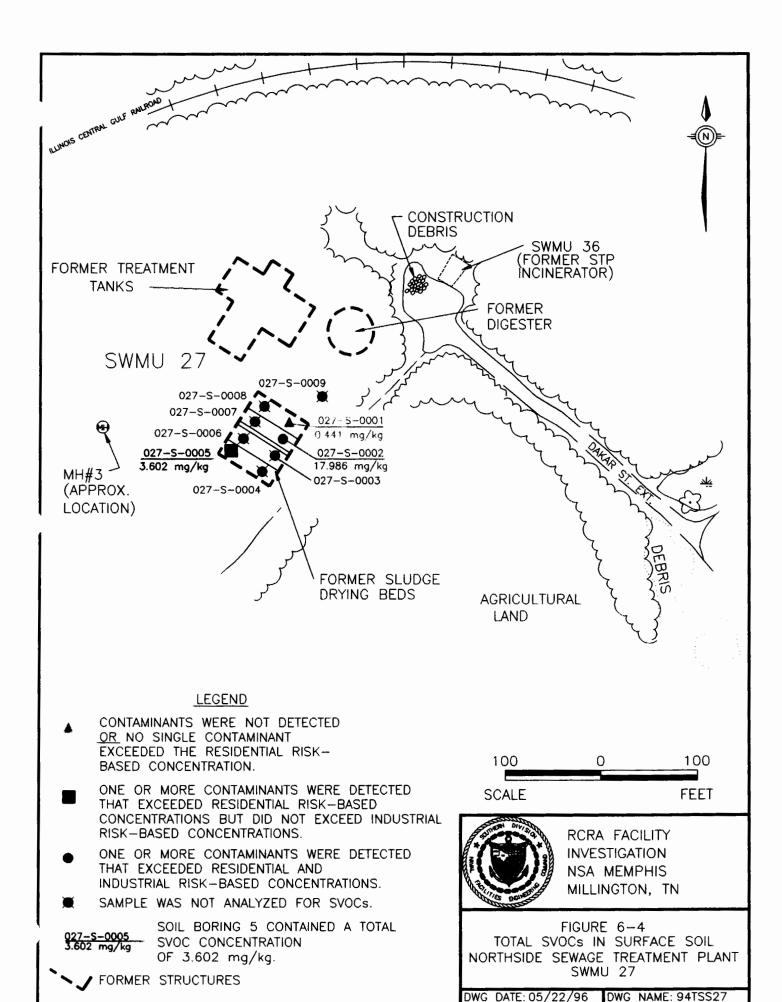
SVOCs

Nineteen SVOCs were detected in the three surface soil samples. At Location 2, the benzo(a)pyrene concentration (1.1 mg/kg) exceeded the industrial RBC (0.78 mg/kg) but did not exceed the SSL (4 mg/kg). The benzo(a)pyrene concentration at Location 5 (0.29 mg/kg) exceeded the residential RBC (0.088 mg/kg) but not the SSL. The concentration of benzo(a)anthracene (1.4 mg/kg) exceeded both the residential RBC (0.88 mg/kg) and the SSL (0.7 mg/kg) at Location 2. Benzo(b)fluoranthene (1.2 mg/kg) and dibenz(a,h)anthracene (0.23 mg/kg) exceeded the residential RBCs (0.88 mg/kg and 0.088 mg/kg, respectively) but not the SSLs (4 mg/kg and 11 mg/kg, respectively) at Location 2. The chrysene concentration at Location 2 (1.3 mg/kg) exceeded the SSL (1 mg/kg) but not the residential RBC (88 mg/kg). Figure 6-4 provides a plot of total SVOC concentrations in surface soil and indicates whether residential and industrial RBCs for individual SVOCs are exceeded at each location. Table 6-1 lists each detected concentration.

Metals

Sixteen metals were detected in the surface soil samples, most of which exceeded their background reference concentration (RC, or two times the mean background concentration) at NSA Memphis. Arsenic, detected at each sampling location, exceeded the RC (13.2 mg/kg), industrial RBC (3.8 mg/kg), and the SSL (13.2 mg/kg) at Locations 1 (33 mg/kg detected) and 2 (15.9 mg/kg). The arsenic concentration also exceeded the industrial RBC but not the RC or SSL at Locations 3, 5, 6, 7, 8, and 9. Beryllium was identified at concentrations above the residential RBC in most samples; however, the background RC of beryllium exceeds the residential RBC. No other metal exceeded its residential RBC.





The SSL for barium was exceeded in every sample; however, the background RC for barium was only exceeded at two sampling locations. The SSL and RC for mercury were exceeded at one location. Figure 6-5 provides a plot of metals concentrations in surface soil samples compared with their RCs and RBCs, and Table 6-1 summarizes the detected metals concentrations in surface soil.

6.2.2 Subsurface Soil Samples

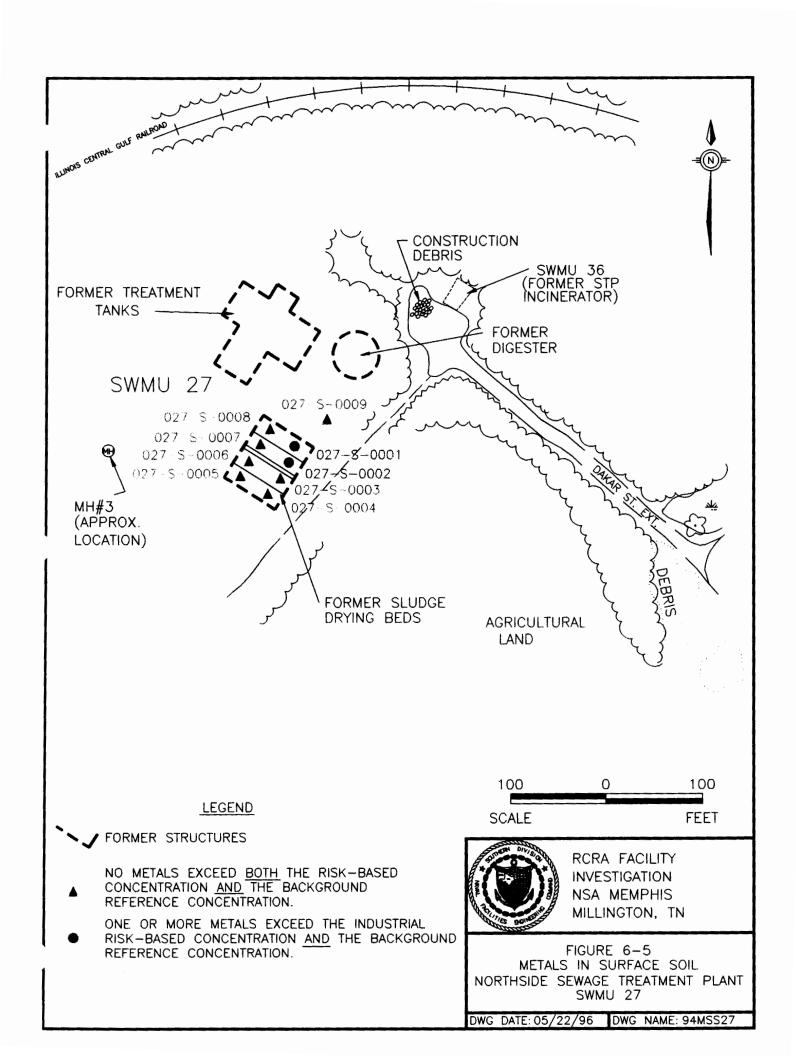
E/A&H collected 18 subsurface soil samples from two intervals at each of the nine sampling locations. The samples were analyzed for VOCs and Appendix IX metals. Figure 4-1 shows the sampling locations, and Table 6-2 summarizes the detected contaminant concentrations.

VOCs

The only VOCs detected in subsurface soil samples were isopropylbenzene/bromobenzene at Location 6 (0.0411 mg/kg, 5- to 6-foot interval). These VOCs were detected by the onsite laboratory only. The laboratory instrumentation could not distinguish between the two VOCs because of similar retention times for these compounds. No RBC exists for either isopropylbenzene or bromobenzene.

Metals

Sixteen metals were detected in the subsurface soil samples. Barium exceeded its SSL (32 mg/kg) and its RC (289 mg/kg) at Location 6 (294 mg/kg) only. No other subsurface soil sample exceeded both the RC and SSL. Antimony was detected at Location 1 (20.4 mg/kg; 4 to 5 feet bls) and Location 2 (18 mg/kg; 5 to 6 feet bls) at concentrations exceeding the RC (not detected). No SSL exists for antimony. Tin was detected at Location 1 (5.5 mg/kg; 12 to 14 feet bls) and Location 2 (4.4 mg/kg; 5 to 6 feet bls) at concentrations exceeding the RC (not detected). No SSL exists for tin.



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6.3 Groundwater Results

No VOCs were identified in groundwater by the onsite laboratory. The only VOCs identified in groundwater by the offsite laboratory were in duplicate samples submitted for confirmation analysis. At Location 5, 7 micrograms per liter (μ g/L) acetone and 1 μ g/L toluene were identified in groundwater from the upper fluvial deposits. At Location 9, 18 μ g/L acetone and 2 μ g/L carbon disulfide were detected. Acetone is a common laboratory artifact. No RBCs for tap water or MCLs for drinking water were exceeded by VOCs detected in groundwater. Figure 6-6 provides a plot of VOCs in groundwater compared with their RBCs and MCLs, and Table 6-3 summarizes the detected VOCs in groundwater.

6.4 Summary of Nature and Extent

Analytical results indicate minimal contamination, if any, by VOCs in soil and groundwater. No VOC concentration in surface soil exceeded its RBC or SSL. No VOC concentration in subsurface soil exceeded its RBC or SSL. No VOC concentration in groundwater exceeded either the RBC for tap water or the MCL for drinking water.

Eight pesticides were detected in the three surface soil samples. The dieldrin concentration in two surface soil samples exceeded the industrial RBC and the SSL and exceeded the residential RBC and the SSL in the third sample. However, dieldrin is ubiquitous to NSA Memphis due to its basewide aerial application during the 1950s and 1960s. Aldrin was detected above the SSL in one surface soil sample, but it did not exceed its residential RBC.

Nineteen SVOCs were detected in the three surface soil samples. Benzo(a)pyrene exceeded its industrial RBC at one location and its residential RBC at a second location. Benzo(a)anthracene exceeded both the residential RBC and the SSL at one location. Benzo(b)fluoranthene and dibenz(a,h)anthracene exceeded the residential RBC at one location. Chrysene exceeded its SSL at one location.

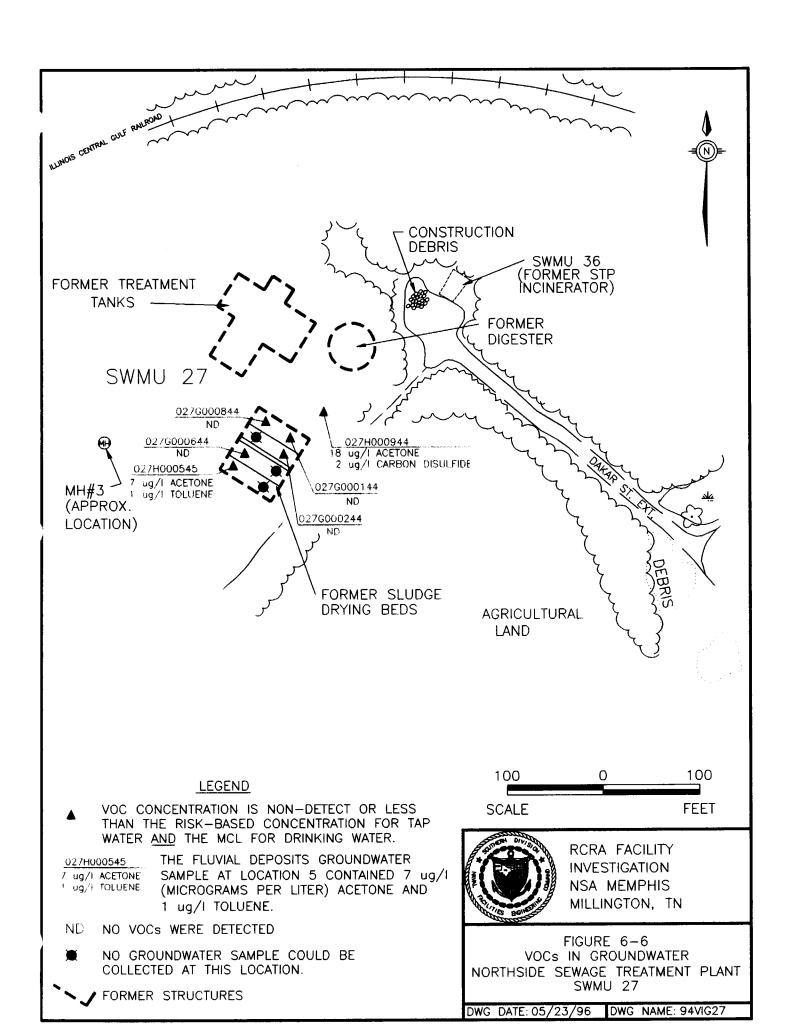


Table 6-3

Detected Concentrations of VOCs in Groundwater
SWMU 27 — Northside Sewage Treatment Plant
(data in micrograms per liter)

Sample Location/ID

Analyte	5 (44' to 45') 027H000545	9 (43' to 44') 027H000944	RBC• Tap Water	MCL ^b Drinking Water
Acetone	7 Jc	18	3,700	_4
Carbon Disulfide	ND•	2 J	1,000	
Toluene	1 J	ND	750	1,000

Notes:

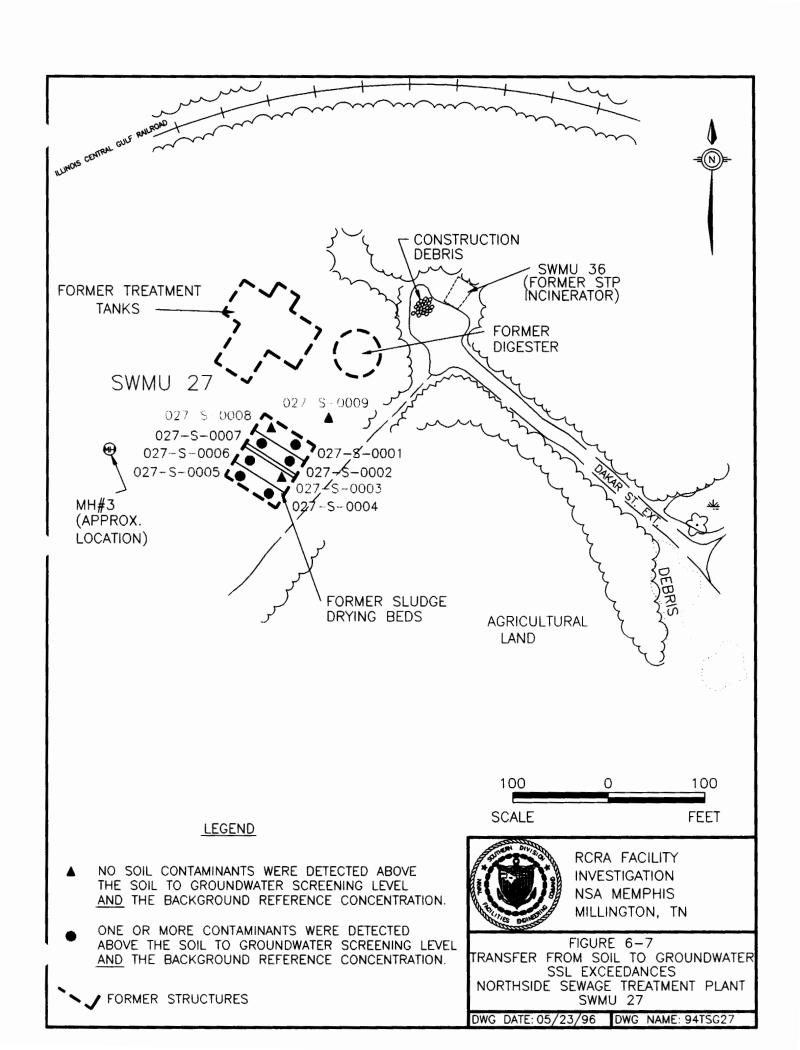
- RBC = Risk-Based Concentration; obtained from the USEPA Region III Risk-Based Concentrations Table, July to December 1995.
- b MCL = Maximum Contaminant Level for Drinking Water; obtained from the USEPA Drinking Water Regulations and Health Advisories, May 1995.
- c J = Estimated concentration
- d No guidance concentration exists for this analyte.
- ND = Analyte was not detected.

Sixteen metals were detected in the surface soil samples, most of which exceeded their background RC. Arsenic exceeded the RC, the SSL, and the industrial RBC at two locations. Beryllium was identified at concentrations above the residential RBC in most samples; however, the background RC of beryllium exceeds the residential RBC. No other metal exceeded its residential RBC. The background RC and the SSL were exceeded at two sampling locations for barium and at one location for mercury.

Sixteen metals were detected in the subsurface soil samples. Barium exceeded the SSL and the RC in one sample. Antimony and tin, which do not have SSLs, exceeded their RCs in two subsurface soil samples each.

Contaminant Transfer from Soil to Groundwater

Tables 6-1 and 6-2 provide SSL values for transfer from surface and subsurface soil to groundwater. Figure 6-7 illustrates that both RCs and SSLs were exceeded by one or more contaminants at sample locations 1, 2, 4, 5, 6, and 7.



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7.0 PRELIMINARY RISK EVALUATION

In accordance with Guidance on Preliminary Risk Evaluations for the Purpose of Reaching a

Finding of Suitability to Lease (USEPA Region IV Memorandum, November 1994), a PRE was

conducted for SWMU 27 to finalize the RCRA closure of the SWMU.

Nine surface soil samples were collected; two sampling locations were in each of the four cells

comprising the sludge drying beds and one location north of the sludge drying beds in a

presumed upgradient location. Each of the samples were analyzed for VOCs (USEPA

Method 8021 by the onsite laboratory) and Appendix IX metals (USEPA Method 6010/7000

series). Additional surface soil collected at three of the nine sampling locations was analyzed

for SVOCs (USEPA Method 8270) and pesticides/PCBs (USEPA Method 8080).

A PRE is conducted by constructing a table for carcinogenic and systemic (noncarcinogenic)

compounds. The maximum concentration for each detected chemical and its corresponding

RBC concentration is entered into the table to calculate cumulative human health risk. Soil data

used in the calculations are exclusively from samples collected across the surface soil interval

(0 to 1 foot bls).

Proportionate risk is calculated for each detected site chemical by comparing its maximum

reported concentration with the corresponding RBC value. Risk and hazard for residential and

commercial scenarios were calculated separately. RBC values were calculated by USEPA based

on a risk threshold of 10-6 for carcinogens or a hazard quotient threshold of 1.0 for

noncarcinogens. Therefore, a risk ratio is calculated for each contaminant by one of the

following two equations:

7-1

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Carcinogenic Risk Ratio: $RR = \underline{media\ concentration} \times TR$

screening value

Noncarcinogenic Risk Ratio: $RR = \underline{media\ concentration} \times THQ$

screening value

where:

RR = the risk ratio

Media Concentration = the maximum concentration of a site chemical Screening Value = the RBC value for that particular chemical

TR = target risk used by USEPA to calculate RBCs for

carcinogens (10-6)

THQ = target hazard quotient used by USEPA to calculate RBCs

for noncarcinogens (1.0)

Tables 7-1 and 7-2 summarize PRE results for SWMU 27 for carcinogens and noncarcinogens, respectively. The risk ratios for each chemical are summed separately for both residential and commercial scenarios to determine the overall site risk. Cumulative risk (for carcinogens) and cumulative hazard index (HI) (for noncarcinogens) are calculated separately, and the cumulative risk and HI are each compared to the corresponding cumulative threshold in accordance with the USEPA Region IV Memorandum, November 1994.

If the carcinogenic ILCR is greater than 10-4 (the cumulative risk threshold) or the noncarcinogenic HI is greater than 1 (the cumulative HI threshold), the site may require additional investigation for the corresponding land use scenario (USEPA Region IV Memorandum, November 1994). If neither threshold is exceeded, the property is considered suitable to lease for the specified land use scenario.

Table 7-1
Preliminary Risk Evaluation for SWMU 27
Residential and Commercial Carcinogens
NSA Memphis RFI

	Reference		Residential RBC		Commercial RBC	
	Concentration	Maximum	Carcinogen	Risk	Carcinogen	Risk
Parameter	(mg/kg)	(mg/kg)	(mg/kg)	Ratio	(mg/kg)	Ratio
Acenaphthene		0.3				
Acenaphthylene		0.045				
Aldrin		0.0097				
Anthracene		0.094				
Antimony	ND	19.1				
Arsenic	13.1	33	0.43	7.7E-05	3.8	8.7E-06
Barium	19.1	225				
Benzo(a)anthracene		0.32	0.88	3.6E-07	7.8	4.1E-08
Benzo(a)pyrene		0.29	0.088	3.3E-06	0.78	3.7E-07
Benzo(b)anthracene		0.33	0.88	3.8E-07	7.8	4.2E-08
Benzo(g,h,i)perylene		0.16				
Benzo(k)fluoranthene		0.28	8.8	3.2E-08	78	3.6E-09
Beryllium	0.96	1.2	0.15	8.0E-06	1.3	9.2E-07
Cadmium	ND	1.6				
Carbazole		0.04	32	1.3E-09	290	1.4E-10
Chromium	26.4	17				
Chrysene		0.31	88	3.5E-09	780	4.0E-10
Cobalt	15	8			•	
Copper	23.6	38.4				
4,4'-DDD		0.0026	2.7	9.6E-10	24	1.1E-10
4,4'-DDT		0.019	1.9	1.0E-08	17	1.1E-09
Dibenzo(a,h)anthracene		0.23	0.088	2.6E-06	0.78	2.9E-07
Dibenzofuran		0.24				
Dieldrin		1.2	0.04	3.0E-05	0.36	3.3E-06
Endrin		0.0081				
Fluoranthene		0.63				
Fluorene		0.24				
Heptachlor epoxide		0.019	0.07	2.7E-07	0.63	3.0E-08
Indeno(1,2,3-cd)pyrene		0.14	0.88	1.6E-07	7.8	1.8E-08
Lead	28.7	277	400		1000	
2-Methylnaphthalene		0.063				
Mercury	1.1	3.1				
Naphthaiene		0.25				
Nickel	1.1	18.7				
Phenanthrene		0.36				
Ругеве		0.56				
Selenium	ND	0.5				
Silver	ND	15.8				
Technical chlordane		0.67	4.4	1.5E-07	0.49	1.4E-06
Tio .		22.1	4.4		0.47	
	49.6	26.1				
Vanadium						
Vanadium Zinc	88.3	239				

NOTES:

ILCR Incremental excess lifetime cancer risk

HI Hazard index

Blank spaces Indicates not applicable

ND Not detected

- All concentrations are in parts per million (mg/kg).
- The maximum concentration reported for each consaminant was used to develop the table above.
- Soil sample data were from the surface (0-1') interval only.
- Screening values (RBCs) are from the July to December 1995
 Risk-Based Concentration (RBC) Table (October 20, 1995 USEPA
 Region III RBC memo).
- The maximum lead (Pb) concentration reported at SWMU 27 was 277 mg/kg. This is less than the 400 mg/kg residential soil screening level for total lead (USEPA OSWER Directive 9355.4-12).
 The RBC for naphthalene was used as a surrogate for acenaphthalene,
- which does not have an RBC.

 The RBC for pyrene was used as a surrogate for phenanthrene and benzo(g, h, i)perylene, which do not have RBCs.
- The technical chlordane concentration was used rather than the individual isomer concentrations to provide a conservative estimate.
- Metal was excluded from the risk ratio because the maximum reported concentration is less than the corresponding reference concentration.

Table 7-2 Preliminary Risk Evaluation for SWMU 27 Residential and Commercial Noncarcinogens NSA Memphis RFI

NSA Memphis RFI	D-4		D-1111 DBC		C LDDC	
	Reference		Residential RBC		Commercial RBC	Hazard
.	Concentration	Maximum	Noncarcinogen	Hazard	Noncarcinogen	
Parameter	(mg/kg)	(mg/kg)	(mg/kg)	Ratio	(mg/kg)	Ratio
Acenaphthene		0.3	4700	6.38E-05	120000	2.50E-06
Acenaphthylene		0.045	3100	1.45E-05	82000	5.49E-07
Aldrin		0.0097	0.038	0.2553	0.34	0.029
Anthracene		0.094	23000	4.09E-06	610000	1.54E-07
Antimony	ND	19.1	31	0.6161	820	0.02
Arsenic	13.1	33	23	1.4348	610	0.05
Barium	19.1	225	5500	0.0409	140000	0.001
Benzo(a)anthracene		0.32				
Benzo(a)pyrene		0.29				
Benzo(b)anthracene		0.33				
Benzo(g,h,i)perylene		0.16	2300	6.96E-05	61000	2.62E-0
Benzo(k)fluoranthene		0.28				
Beryllium	0.96	1.2				
Cadmium	ND	1.6	39	0.0410	1000	0.001
Carbazole		0.04				
Chromium	26.4	17	390		10000	
Chrysene	20.1	0.31	3,0			
Cobalt	15	8	4700		120000	
Copper	23.6	38.4	3100	0.0124	82000	0.0004
4,4'-DDD	2.0	0.0026	3100	0.0124	02000	0.0001
4,4'-DDT		0.019				
Dibenzo(a,h)anthracene		0.23				
Dibenzo(u,n)anunracene Dibenzofuran		0.24	310	0.0008	8200	2.93E-0
Dieldrin		1.2	310	0.0008	6200	2.936-0
Endrin		0.0081	23	0.00035	610	1.33E-0
Fluoranthene		0.0081	23 3100		82000	7.68E-0
				0.00020		
Fluorene		0.24	3100	0.00008	82000	2.93E-0
Heptachlor epoxide		0.019				
Indeno(1,2,3-cd)pyrene	20.0	0.14				
Lead	28.7	277				
2-Methylnaphthalene		0.063	3100	2.03E-05	82000	7.68E-0
Mercury	1.1	3.1	23	0.13	610	0.005
Naphthalene		0.25	3100	0.0001	82000	3.05E-0
Nickel	1.1	18.7	1600	0.0117	41000	0.0004
Phenanthrene		0.36	2300	0.00016	61000	5.90E-0
Pyrene		0.56	2300	0.00024	61000	9.18E-0
Selenium	ND	0.5	390	0.0013	10000	5.00E-0
Silver	ND	15.8	390	0.0405	10000	0.001
Technical chlordane		0.67				
Tin		22.1	47000	0.0005	1000000	0.000
Vanadium	49.6	26.1	550		14000	
Zinc	88.3	239	23000	0.0104	610000	0.00039
		н	SUM	3	SUM	0.12

NOTES:

ILCR Incremental excess lifetime cancer risk

HI Hazard index

Blank spaces Indicates not applicable

ND Not detected

- All concentrations are in parts per million (mg/kg).
- The maximum concentration reported for each contaminant was used to develop the table above.
- Soil sample data were from the surface (0-1') interval only.
- Screening values (RBCs) are from the July to December 1995
 Risk-Based Concentration (RBC) Table (October 20, 1995 USEPA
 Region III RBC memo).
- The maximum lead (Pb) concentration reported at SWMU 27 was 277 mg/kg. This is less than the 400 mg/kg residential soil screening level for total lead (USEPA OSWER Directive 9355.4-12).
 - The RBC for naphthalene was used as a surrogate for acenaphthalene, which does not have an RBC.
- The RBC for pyrene was used as a surrogate for phenanthrene and benzo(g,h,i)perylene, which do not have RBCs.
- The technical chlordane concentration was used rather than the individual isomer concentrations to provide a conservative estimate.
- Metal was excluded from the risk ratio because the maximum reported concentration is less than the corresponding reference concentration.

This PRE does not evaluate the potential exposure that might be experienced by construction workers should site structures be excavated in the future. This would require an acute or subchronic assessment of subsurface soil data. For the site worker scenario, USEPA recommends an exposure duration of 25 years — a chronic exposure scenario. Exposure durations less than seven years, as would be assumed for a construction worker scenario, are considered acute or subchronic. Assuming a construction worker is exposed to subsurface soil for three years, cumulative risk and hazard estimates would be approximately one order of magnitude less than those presented in this PRE.

USEPA used chronic-based toxicological information when calculating RBCs, or USEPA makes conservative adjustments to reflect chronic exposure. In addition to the effect the exposure duration differences would have on a construction worker's cumulative risk and hazard estimates, toxicological information used by USEPA to calculate RBCs would be adjusted to reflect acute or subchronic toxicological endpoints rather than the chronic endpoints typically used. Acute and subchronic thresholds are based on lower exposure durations than chronic thresholds, and higher concentrations are generally necessary to elicit observable toxic effects. Higher thresholds for toxic effects result in less conservative toxicological information, which would be used to adjust RBCs for either acute or subchronic exposure. Because a construction worker would be exposed under either acute or subchronic conditions, and RBCs based on chronic exposure are generally more conservative, the commercial site worker scenario presented in this PRE would be a more conservative scenario than that for a construction worker.

The maximum concentrations reported in SWMU 27 soil were generally from 0 to 1 foot bls, and exposure to maximum reported soil concentrations would occur within that interval. Therefore, the cumulative risk and hazard estimates presented in this PRE are conservative for most reported chemicals relative to subsurface soil.

NSA Memphis, Millington, Tennessee

Revision 2: September 25, 1996

According to the Base Reuse and Development Plan (RKG Associates Inc., 1995), SWMU 27,

the site of a former sewage treatment plant, will likely be developed as a commercial property.

Surface soil samples were collected from the former sewage sludge drying beds, which would

most likely be sinks for contaminants. Due to the nature of this proposed use, a commercial

setting can be assumed to evaluate risk. With respect to the commercial scenario, the resulting

ILCR and HI were below the established criteria of 104 and 1, respectively.

estimated for the residential scenario was approximately equal to the 10⁻⁴ ILCR threshold, and

the HI of 3 for the residential scenario exceeded the established threshold of 1.

Conclusions and Recommendations

Based on the information gathered during this investigation, the following conclusions and

recommendations have been reached:

SWMU 27 will likely be developed for commercial land use.

Forty-three SVOCs, pesticides, and metals were detected in surface soil samples.

of benzo(a)pyrene, beryllium, Maximum reported concentrations arsenic,

dibenzo(a,h)anthracene, and dieldrin exceeded residential soil RBCs, and concentrations

reported for arsenic and dieldrin exceeded the corresponding commercial (industrial)

RBCs.

Based on a PRE performed on data from samples collected from the 0 to 1-foot bls

interval:

Carcinogens — The commercial ILCR did not exceed the 10-4 threshold,

indicating suitability for lease with no further action for commercial land use.

7-6

- Carcinogens The residential ILCR was estimated to be approximately equal to the 10-4 threshold, and further discussion and/or investigation may be warranted to determine the suitability for lease for residential land use.
- Noncarcinogens The commercial HI did not exceed 1, indicating suitability
 for lease with no further action for commercial land use.
- Noncarcinogens The residential HI of 3 exceeded the cumulative threshold of 1, and further discussion and/or investigation may be warranted to determine the suitability for lease for a residential scenario.

Confirmatory Sampling Investigation Report Assembly C — SWMU 27, Northside Sewage Treatment Plant

NSA Memphis, Millington, Tennessee

Revision 2: September 25, 1996

8.0 CONCLUSIONS AND RECOMMENDATIONS

During the CSI at SWMU 27, surface and subsurface soil samples were collected from nine sampling locations in the former sludge drying beds. In addition, groundwater samples were collected from the upper fluvial deposits at six of the nine sampling locations. The soil and groundwater samples were analyzed for VOCs by Hydrologic's onsite laboratory. NET's Bedford, Massachusetts, laboratory analyzed nine soil samples for Appendix IX metals and three soil samples for SVOCs and pesticides/PCBs. A PRE was developed using the data from the surface soil samples. Based on the CSI and the PRE, the following conclusions and recommendations have been reached:

- The only VOCs identified in surface and subsurface soil were isopropylbenzene and bromobenzene at Locations 3 and 6. No RBC exists for either of these compounds, which could not be distinguished by the onsite laboratory instrumentation due to similar retention times.
- No VOCs were identified in groundwater by the onsite laboratory. Three groundwater samples split and submitted to the offsite laboratory for confirmation analysis contained low concentrations of acetone, toluene, and carbon disulfide in one or more samples. Acetone is a common laboratory artifact. No RBCs for tap water or MCLs levels for drinking water were exceeded by VOCs detected in groundwater.
- Eight pesticides were detected in the three surface soil samples. The dieldrin concentration exceeded the industrial RBC and the SSL in two samples, and the residential RBC and the SSL in the third sample. However, dieldrin is ubiquitous to NSA Memphis due to its basewide aerial application during the 1950s and 1960s. Aldrin was detected above the SSL, but did not exceed its residential RBC.

Revision 2: September 25, 1996

Nineteen SVOCs were detected in the three surface soil samples. Benzo(a)pyrene exceeded the industrial RBC at one location and the residential RBC at a second location. Benzo(a)anthracene exceeded both the residential RBC and the SSL at one location. Benzo(b)fluoranthene and dibenz(a,h)anthracene exceeded the residential RBC at one location, and chrysene exceeded the SSL at one location.

- Sixteen metals were detected in the surface soil samples, most of which exceeded their background RC at NSA Memphis. Arsenic exceeded its RC, industrial RBC, and SSL at two locations. Beryllium was identified at concentrations above the residential RBC in most samples; however, the background RC of beryllium exceeds the residential RBC. No other metal exceeded its residential RBC. The SSL and the background RC were exceeded for barium at two sampling locations and for mercury at one location.
- Sixteen metals were detected in the subsurface soil samples. Barium exceeded the SSL
 and the RC in one sample. Antimony and tin, which do not have SSLs, exceeded their
 RC in two subsurface soil samples each.
- The PRE results indicate the property is suitable to lease for commercial land use. Based
 on the results of the first phase and the anticipated commercial land use of the property,
 no further action is recommended for SWMU 27.

9.0 REFERENCES

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- United States Geological Survey (1995). Oral and written communication with Mr. Jack Carmichael. USGS: Nashville, Tennessee.
- United States Environmental Protection Agency (July 14, 1994). Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. Office of Solid Waste Emergency Response (OSWER) Directive 9355.4-12.

Appendix A

Analytical Data

FORMAT: XXXX \ 1 2 3 4 5 6 7 8 9 0

XXXX \ OPTIONAL project prefix
1 2 3 SITE where sample collected

4 - MATRIX / QC code

5 6 7 8 · SAMPLING LOCATION 9 0 · DEPTH, INTERVAL, SERIAL #

All spaces MUST be filled and no extra characters included. Use zeroes as space-fillers. Indicate MS/MSDs on COCs.

MATRIX/QC CODES:

S - soil (surface, borings, and trenches)

C - soil duplicate sample

M - sediment (settled, fluid-borne solid)

N - sediment duplicate

G - groundwater

H - groundwater duplicate sample

W - surface water

R - surface water duplicate sample

U - sludge

Y - sludge duplicate

A - air

Z - liquid waste (including IDW drums)

V - solid waste (including IDW drums)

T - trip blank

E - equipment rinsate blank

D - DI system blank

P - potable water blank

F - field blank

L - filter blank

B - EPA blind spike sample

2 - cement blank

3 - drilling mud

4 - grout blank

5 - bentonite blank

6 - sand blank

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APX9-METAL SAMPLE ID> ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> MATRIX> UNITS>	027-S-0001-01 027S000101 1-124683S 027S000101 06/06/95 Soil MG/KG	027-S-0001-05 027S000105 1-124684S 027S000105 06/06/95 Soil MG/KG	027-S-0001-14 027S000114 1-124685S 027S000114 06/06/95 Soil MG/KG	027-S-0002-01 027-S-0002-0275000201 0275000206 1-124686S 1-124687S 0275000201 0275000206 06/06/95 Soil MG/KG MG/KG	027s000212 1-124688s
SB Antimony AS Arsenic BA Barium BE Beryllium CD Cadmium CR Chromium CO Cobalt CU Copper PB Lead HG Mercury NI Nickel SE Selenium AG Silver TL Thallium Vanadium ZNN Zinc Tin	19.1 J 33. J 153. J 1.2 J 1.3 J 9. J 3.8 UJ 13.5 J 40.4 1.6 5.5 UJ 0.48 J 6.6 J 0.43 UJ 9.7 J 178. 12.1 J	20.4 J 11.9 J 160. J 0.42 J 2.6 J 9.4 J 8.1 J 17.5 J 12.6 0.12 U 20.8 J 0.52 U 0.77 UJ 0.52 UJ 19.9 J 54.2 3.9 UJ	1441 VAL 12.8 UR 6.4 J 72.9 J 0.34 J 2.2 J 6.4 J 7.4 J 12.7 J 8.5 0.12 U 15.1 J 0.51 U 0.77 UJ 0.51 UJ 14.6 J 39.9 5.5 J	1441 VAL 1441 18.5 J 18. 15.9 J 13.2 109. J 191. 0.97 J 0.54 0.7 UJ 2.4 5.5 J 10.3 4.5 UJ 11.9 14.3 J 18. 22.9 14.5 0.3 0.12 5.9 UJ 26.3 0.47 U 26.3 0.47 U 0.51 2.3 UJ 0.57 0.47 UJ 0.55 2.3 UJ 0.57 69.7 60.8 5.5 J 4.4	J 73.8 J 0.33 J 1.3 J 7.4 J 8. J 16.1 J 10.7 2 U 0.12 U 16.5 J 1 U 0.51 U 7 UJ 0.51 U J 15.6 J 51.1

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APX9-METAL SAMPLE ID> ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> MATRIX> UNITS>	027\$000501 8-124865\$ 027\$000501	027-s-0005-06 027s000506 8-124866s 027s000506 06/08/95 Soil MG/KG	027-s-0005-12 027s000512 8-124867s 027s000512 06/08/95 Soil MG/KG	027-C-0005-12 027C000512 8-124857S 027C000512 06/08/95 Soil MG/KG	027-s-0006-01 027s000601 8-124868s 027s000601 06/08/95 soil MG/KG	027-S-0006-06 0275000606 8-124869S 0275000606 06/08/95 Soil MG/KG
CAS # Parameter	1446 VAL	1446 VAL	1446 VAL	1446 VAL	1446 VAL	1446 VAL
SB Antimony AS Arsenic BA Barium BE Beryllium CD Cadmium CR Chromium CO Cobalt CU Copper PB Lead HG Mercury Ni Nickel SE Selenium AG Silver TL Thallium Vanadium ZN Zinc SN Tin	12.1 UJ 9.4 202. 0.45 J 0.82 J 11.2 8. J 23.5 43.7 0.75 18.7 0.58 UR 2.3 J 0.48 UJ 15.4 138. 11.3 U	12.3 UJ 5.6 121. 0.34 J 0.74 U 9.9 6.1 J 7.1 7. 0.12 U 14.9 0.52 UR 1.2 UR 0.49 UJ 14.4 39.5 4.8 U	12.5 UJ 5.1 115. 0.4 J 0.75 U 15. 5.1 J 7.9 7.8 0.12 U 14.9 1.1 UR 1.2 UR 0.5 UJ 17.5 45.9 3.7 U	12.4 UJ 7.7 131. 0.57 J 0.75 U 17.3 7.2 J 8.9 11.9 0.12 U 16.6 0.71 UR 1.2 UR 0.87 UJ 25.1 56.9 3.7 U	12.8 UJ 7.7 120. 0.65 J 0.77 U 16.4 6.6 J 11. 30.6 0.25 14.9 0.86 UR 1.3 UR 0.51 UJ 19.1 86.8 6.4 U	12.1 UJ 8.9 294. 0.59 J 0.72 U 16.7 8.7 J 13.1 9.4 0.11 U 33.1 0.54 UR 1.2 UR 0.48 UJ 30. 73.4 6.4 U

NSA MEMPHIS NSA MEMPHIS, RFI, ASSEMBLY C SWMU 27 - SOIL SAMPLES

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CAS #	Parameter		1446	VAL	1446	VAL	1446	VAL	1446	VAL	1446	VAL	1446	VAL
AS BA BE CD CR CO CU PB HG NI SE AG TL V ZN	Antimony Arsenic Barium Beryllium Cadmium Chromîum Cobalt Copper Lead Mercury Nickel Selenium Silver Thallium Vanadium Zinc Tin		12.6 5.1 110. 0.39 0.76 13.4 4.2 8.6 6.1 0.12 14.4 0.71 1.3 0.5 12.9 55.5 3.8	UJ J U UR UR UJ U	10.7 4. 148. 0.21 0.97 6.7 1.3 38.3 277. 3.1 5.3 0.43 15.8 0.43 2.8 163. 19.9	UJ U U U U	12. 7. 167. 0.46 0.72 15. 7. 7.7 7.8 0.11 19.6 0.48 1.2 0.48 23.5 45.4 4.	UJ J U UR UR UJ U	11.9 8.7 151. 0.38 0.72 13.5 7.6 7.4 10.6 0.11 19.4 0.48 1.2 0.48 19.8 58.5 6.	UJ U UR UR UJ	11.3 10.6 110. 0.41 0.68 12.8 7.9 8.8 24.7 0.13 14.8 0.45 1.1 0.45 18.3 49.1 4.1	J U UR UR UJ	12.3 14.2 138. 0.44 0.74 10.2 9.3 11.8 14.5 0.12 21.8 0.49 1.2 0.49 17.2 89.2 7.7	UJ UUR UR UR UJ U

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CAS # Parameter SB Antimony As Arsenic BA Barium BE Beryllium CD Cadmium CR Chromium CO Cobalt CU Copper PB Lead HG Mercury NI Nickel SE Selenium AG Silver TL Thallium V Vanadium	1446 VAL 12.1 UJ 7.9 113. 0.38 J 0.73 U 11.7 7. J 9.4 9.6 0.12 U 18.3 0.75 UR 1.2 UR 0.48 UJ 17.1	1447 VAL 12.5 UJ 9.2 77.8 0.3 J 0.99 J 6.7 J 6.5 J 12.9 9.4 0.12 U 23.2 0.53 J 0.77 U 0.5 UJ 12.5 J	12.6 UJ 7.8 68.6 0.3 J 1.3 J 8. 6.4 J 13.4 6.8 0.12 U 18.5 0.51 UJ 0.83 J 0.51 UJ 13.2	12.3 UJ 11.2 52.7 0.33 J 1.1 J 9.7 5.4 J 11.3 10.2 0.12 U 10.2 0.5 J 0.74 U 0.49 UJ 26.1	12.8 UJ 13.7 134. 0.47 J 1.9 J 10. 7.1 J 18.1 13. 0.12 U 26.6 0.51 UJ 0.76 U 0.51 UJ 18.9	1447 VAL 13. UJ 7.9 60.1 0.28 J 0.78 UJ 4.9 J 5.7 J 13.2 9. 0.12 U 17.5 0.53 J 0.97 J 0.5 UJ 13.1
Zinc SN Tin	44.6 J 4.8 U	40. 5.2 U	3.8 U	31.6 3.7 U	59. 4.3 U	38. 7.7 U

NSA MEMPHIS NSA MEMPHIS, RFI, ASSEMBLY C SWMU 27 - SOIL SAMPLES

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SM846-PEST SAMPLE ID>	027SSB1001 143759 027SSB1001 03/06/96 03/14/96 03/16/96		027-S-0002-01 027SSB1101 143760 027SSB1101 03/06/96 03/14/96 03/16/96 Soil UG/KG		027-S-0005-0 027SSB1201 143761 027SSB1201 03/06/96 03/14/96 03/18/96 Soil UG/KG	1	
CAS # Parameter	1717 V	/AL	1717	VAL	1717	VAL	AL .
309-00-2 58-89-9 319-84-6 319-85-7 319-86-8 delta-BHC 57-74-9 Chlordane 72-54-8 4,4'-DDD 72-55-9 4,4'-DDT 50-29-3 60-57-1 Dieldrin 959-98-8 Endosulfan I 33213-65-9 Endosulfan II 1031-07-8 Endosulfan sulfate 72-20-8 Fadrin 7421-93-4 Heptachlor Heptachlor Heptachlor 1024-57-3 72-43-5 8001-35-2 Toxaphene 12674-11-2 Aroclor-1016 11104-28-2 Aroclor-1221 11141-16-5 53469-21-9 Aroclor-1248 11097-69-1 Aroclor-1254 Aroclor-1260 53494-70-5 5103-71-9 alpha-Chlordane 5103-74-2 gamma-Chlordane Technical Chlordane	2.1 U 2.1 U 2.1 U 2.1 U 2.1 U 2.1 U 3.1 U 4.2 U 4.1 U 4.2 U 4.2 U 4.2 U 4.1 U 4.2 U 4.2 U 4.2 U 4.1 U 4.2 U 4.2 U 4.1 U 4.2 U 4.2 U 4.2 U 4.3 U 4.3 U 4.4 U 4.4 U 4.5 U 4.5 U 4.6 U 4.7 U 4.8 U 4.9 U 4.9 U 4.9 U 4.1 U 4.1 U 4.1 U 4.2 U 4.2 U 4.3 U 4.3 U 4.4 U 4.4 U 4.5 U 4.7 U 4.8 U 4.9 U 4.9 U 4.9 U 4.1 U 4.1 U 4.1 U 4.1 U 4.2 U 4.2 U 4.3 U 4.3 U 4.3 U 4.4 U 4.5 U 4.7 U 4.8 U 4.9 U 4.9 U 4.1 U		9.7 2. 2. 2. 2. NR 4. 4. 19. 1200. 2. 4. 4. 8.1 4. 2. 19. 20. 40. 40. 40. 40. 40. 40. 40. 40. 40. 4	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2. 2. 2. 2. 2. 2. NR 2.6 4.1 14. 710. 2. 4.1 4.5 4.1 2. 6. 20. 41. 41. 41. 41. 41. 41. 41. 41. 41.	ח חחמחחחחחחח במח חחחחחחחחחחחחחחחחחחחחחח	

132-64-9 Dibenzofuran

NSA MEMPHIS NSA MEMPHIS, RFI, ASSEMBLY C SWMII 27 - SOIL SAMPLES

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SWMU 27 - SOIL SAMPLES 027-S-0005-01 SW846-SVOA SAMPLE ID ----> 027-S-0001-01 027-5-0002-01 ORIGINAL ID ----> 027SSB1001 027SSB1101 027SSB1201 143760 143761 143759 LAB SAMPLE ID ---> 027SSB1101 027SSB1201 ID FROM REPORT --> 027SSB1001 03/06/96 03/06/96 SAMPLE DATE ----> 03/06/96 03/11/96 DATE EXTRACTED --> 03/11/96 03/11/96 03/12/96 03/12/96 DATE ANALYZED ---> 03/12/96 MATRIX ----> Soil Soil Soil UNITS ----> ug/Kg ug/Kg ug/Kg 1717 VAL 1717 VAL 1717 VAL CAS # Parameter 108-95-2 Phenol 420. U 400. U 410. U 111-44-4 bis(2-Chloroethyl)ether 420. u 400. U 410. U 95-57-8 2-Chlorophenol 400. U 410. U 420. U 541-73-1 1,3-Dichlorobenzene 420. U 400. П 410. U 106-46-7 1.4-Dichlorobenzene 420. Ħ 400. U 410. IJ 95-50-1 1,2-Dichlorobenzene 420. U 400. U 410. U u 410. U 95-48-7 2-Methylphenol (o-Cresol) 420. บ 400. 410. U 108-60-1 2,2'-oxybis(1-Chloropropane) 420. u 400. U 106-44-5 4-Methylphenol (p-Cresol) 420. H 400. u 410. u U 621-64-7 N-Nitroso-di-n-propylamine 420. U 400. U 410. 420. 400. u 410. u 67-72-1 Hexachloroethane u 98-95-3 Nitrobenzene υ 410. U 420. U 400. 78-59-1 Isophorone 420. u 400. U 410. U 410. U 88-75-5 2-Nitrophenol 420. u 400. U 400. u 410. U 105-67-9 2,4-Dimethylphenol 420. U 120-83-2 2,4-Dichlorophenol 420. U 400. U 410. U 120-82-1 1,2,4-Trichlorobenzene 420. u 400. U 410. u 410. 91-20-3 Naphthalene 420. П 250. J U 106-47-8 4-Chloroaniline 420. H 400. U 410. U 420. U 400. u 410. U 87-68-3 | Hexachlorobutadiene 111-91-1 bis(2-Chloroethoxy)methane 420. U 400. U 410. U 400. U 410. IJ 59-50-7 4-Chloro-3-methylphenol 420. Ú 91-57-6 2-Methylnaphthalene 420. U 63. J 410. U 400. u 410. П 77-47-4 Hexachlorocyclopentadiene 420. u 88-06-2 2,4,6-Trichlorophenol 420. U 400. u 410. U u 1000. U 95-95-4 2.4.5-Trichlorophenol 1000. u 1000. 91-58-7 2-Chloronaphthalene 420. U 400. U 410. U 88-74-4 2-Nitroaniline 1000. U 1000. U 1000. U U 410. U 131-11-3 Dimethyl phthalate 420. 400. U 45. 208-96-8 Acenaphthylene 420. u 43. J J 606-20-2 2.6-Dinitrotoluene 420. U 400. U 410. Ü 99-09-2 3-Nitroaniline 1000. Ü 1000. U 1000. Ü U 410. U 83-32-9 Acenaphthene 420. 300. J U 1000. U 51-28-5 2,4-Dinitrophenol 1000. u 1000. 100-02-7 4-Nitrophenol 1000. U 1000. U 1000.

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NSA MEMPHIS NSA MEMPHIS, RFI, ASSEMBLY C SWMU 27 - SOIL SAMPLES

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SUB46-SVOA SAMPLE ID ORIGINAL ID LAB SAMPLE ID ID FROM REPORT SAMPLE DATE DATE EXTRACTED DATE ANALYZED MATRIX UNITS	> 027SSB1001 > 143759 > 027SSB1001 > 03/06/96 > 03/11/96 > 03/12/96 > Soil	027-s-0002-01 027ssB1101 143760 027ssB1101 03/06/96 03/11/96 03/12/96 Soil ug/Kg	027-s-0005-01 027ssB1201 143761 027ssB1201 03/06/96 03/11/96 03/12/96 Soil ug/Kg		
CAS # Parameter	1717 VAL	1717 VAL	1717 VAL		
121-14-2 84-66-2 7005-72-3 86-73-7 100-01-6 534-52-1 86-30-6 101-55-3 118-74-1 87-86-5 85-01-8 84-74-2 206-44-0 129-00-0 85-68-7 86-73-8 84-74-2 206-44-0 117-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 217-84-0 21	420. U 420. U 420. U 420. U 1000. U 1000. U 420. U 41. J 50. J 420. U 420. U 420. U 41. J 50. J 420. U	400. U 400. U 400. U 380. J 1000. U 1000. U 400. U 400. U 1000. U 3000. 640. 600. 400. U 2900. 2400. 400. U 1400. U 1400. U 1400. U 1200. 890. 1100. 520. 230. J 530. J	410. U 410. U 410. U 410. U 1000. U 1000. U 410. U 410. U 1000. U 360. J 94. J 40. J 410. U 630. 560. 410. U 410. U 320. J 310. J 410. U 410. U 320. J 310. J 410. U 410. U 320. J 310. J 410. U 410. U 410. U 410. J 410. U 410. U 410. J 430. J 280. J 290. J 140. J		

NSA MEMPHIS NSA MEMPHIS, RFI, ASSEMBLY C

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SW846-VOA SAMPLE ID> ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> DATE ANALYZED> MATRIX> UNITS>	027-c-0005-12 027c000512 124857 027c000512 06/08/95 06/12/95 Soil UG/KG	027-C-0008-06 027C000806 124858 027C000806 06/08/95 06/13/95 Soil UG/KG	027-c-0008-12 027c000812 124877 027c000812 06/08/95 06/12/95 Soil UG/KG		
CAS # Parameter	1446 VAL	1446 VAL	1447 VAL		
74-87-3 74-83-9 75-01-4 75-00-3 75-09-2 67-64-1 75-15-0 75-35-4 75-35-4 75-34-3 540-59-0 67-66-3 107-06-2 78-93-3 2-Butanone (MEK) 71-55-6 56-23-5 75-27-4 78-87-5 10061-01-5 79-01-6 124-48-1 79-00-5 71-43-2 10061-02-6 17-8-6 127-18-4 17-18-6 127-18-4 17-18-6 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-7 108-90-90-90-90-90-90-90-90-90-90-90-90-90-	12. U 13. U 14. U 15. U 16. U 17. U	12. UJ	12. U		

Sample Location:027S000101 Lab File ID:NAS195.001 Calibration Std.:vc0606.001 Date: 06/06/95 Blank: blk0606.001 Dilution:

on:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
/inyl Chloride	BDL	BDL	
,1-Dichloroethene	BDL	BDL	
1,2-Dichloroethene	BDL	BDL	
-1,2-Dichloroethene	BDL	BDL	
,1-Dichloropropene	BDL	BDL	
enzene	BDL	n/a	
richloroethene	BDL	BDL	
-1,3-Dichloropropene	BDL	BDL	
1,3-Dichloropropene	BDL	BDL	
oluene	BDL	n/a	
etrachloroethene	BDL	BDL	
hlorobenzene	BDL	BDL	
thylbenzene	BDL	n/a	
n,p-Xylenes	BDL	n/a	
tyrene	BDL	n/a	
-Xylene	BDL	n/a	
FB (surrogate)	54.2	34.9	
0,42	BDL	n/a	
-Propyibenzene	BDL	n/a	
-Chlorotoluene	BDL	BDL	
-Chiorotoluene	BDL	BOL	
3,5-Trimethylbenzene	BDL	n/a	
Butylbenzene	BDL	n/a	
2,4-Trimethylbenzene	BDL	n/a	
butylbenzene/1,3-DCB	BDL	n/a	
4-Dichlorobenzene	BDL	BDL	
-isopropyitoluene	BDL	n/a	
2-Dichlorobenzene	BDL	BDL	
Butylbenzene	BDL	n/a	
2,4-Trichlorobenzene	BDL	BDL	
aphthalene	BDL	n/a	
exachlorobutadiene	BDL	BDL	
,2,3-Trichlorobenzene	BDL	BDL	
ichlorofluoromethane	n/a	BDL	
romomethane	n/a	BDL	
hloroethane	n/a	BDL	
richlorofluoromethane	n/a	BDL	
ethylenechloride	n/a	18.	10
1-Dichloroethane	n/a	BDL	
romochloromethane	n/a	BDL	
hloroform	n/a	BDL	
,2-Dichloropropane	n/a	BDL	
,2-Dichloroethane	n/a	BDL	
1,1-Trichloroethane	n/a	BDL	
arbon Tetrachloride	n/a	BDL	
ibromomethane	n/a	BDL	
2-Dichloropropane	n/a	BDL	
richloroethene	n/a	BDL	
romodichloromethane	n/a	BDL	
1,2-Trichloroethane	n/a	BDL	
,3-Dichloropropene	n/a	BDL	
bibromochloromethane	n/a	BDL	
,2-dibromomethane	n/a	BDL	
,1,1,2-Tetrachloroethane	n/a	BDL	
romoform	n/a	BDL	
1,43	n/a	BDL	
2-Dibromo-3-chloropropene	п/а	BDL	

HydroLogic Mobile Laboratory Analytical Data - Volatile Organic Compounds Memphis Naval Air Station

Sample Location:027S000105 Lab File ID:NAS191.001 Calibration Std.:vc0606.001 Date: 06/06/95 Blank: blk0606.001 Dilution:

ition:

	Concen.	Concen.	Blank
Compound	PiD (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloraethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BOL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	81.1	64.2	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyitoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BOL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BOL	
Methylenechloride	n/a	1.1.	10
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a.	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a.	BDL	
1,1,1-Trichloroethane	n/a.	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL BDL	
1,2-Dichloropropane	n/a		
Trichloroethene	n/a	BDL BDL	
Bromodichloromethane 1.1.2-Trichloroethane	n/a n/a	BDL	
		BDL	
1,3-Dichloropropene Dibromochloromethane	n/a n/a	BDL	
1.2-dibromomethane	•	BDL	
1,1,1,2-Tetrachloroethane	n/a. n/a.	BDL	
Bromoform	n/a. n/a.	BDL	
Bandom	11/04		
41,43	n/a	BDL	

Sample Location:027S000114 Lab File ID:NAS196.001 Calibration Std.:vc0606.001 Date: 06/06/95 Blank: blk0606.001 Dilution:

Dilation:

1

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	8DL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachioroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	76.9	62.8	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL BDL	
Bromomethane	n/a		
Chloroethane	n/a	BDL BDL	
Trichlorofluoromethane	n/a		10
Methylenechloride	n/a	11 _{2.} BDL	10
1,1-Dichloroethane Bromochloromethane	n/a n/a	BDL	
Chloroform		BDL	
	n/a n/a	BDL	
2,2-Dichloropropane	•		
1,2-Dichloroethane	n/a n/a	BDL BDL	
1,1,1-Trichloroethane Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a.	BDL	
1.1.2-Trichloroethane	n/a n/a	BDL BDL	
	n/a.	BDL	
1,3-Dichloropropene Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a n/a	BDL	
Bromoform 41,43	n/a n/a	BDL BDL	

BDL

n/a

1,2-Dibromo-3-chloropropene

HydroLogic Mobile Laboratory Analytical Data - Volatile Organic Compounds Memphis Naval Air Station

Sample Location:027G000144 Lab File ID:NAS190A.001 Calibration Std.:vc0607.001 Date: 06/07/95 Biank: blk0607.001 Dilution:

n:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
-1,2-Dichloroethene	BDL	BDL	
>-1,2-Dichloroethene	BDL	BDL	
,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
:-1,3-Dichloropropene	BDL	BDL	
-1,3-Dichloropropene	BDL	BDL	
oluene	BDL	n/a	
etrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL ,	
thylbenzene	BDL	n/a	
n,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
-Xylene	BDL 91.1	n/a 87.6	
BFB (surrogate) 10.42	91.1 BDL	87.6 n/a	
•	BDL		
i-Propylbenzene i-Chlorotoluene	BDL	n/a BDL	
-Chlorotoluene -Chlorotoluene	BDL	BDL	
,3,5-Trimethylbenzene	BDL	n/a	
-3,5- mmetryiberizerie -Butylbenzene	BDL	n/a	
,2,4-Trimethylbenzene	BDL	n/a	
-butylbenzene/1,3-DCB	BDL	n/a	
,4-Dichlorobenzene	BDL BDL	BDL	
-Isopropyitoluene	BDL	n/a	
,2-Dichlorobenzene	BDL	BDL	
-Butylbenzene	BDL	n/a	
,2,4-Trichlorobenzene	BDL	BDL	
laphthalene	BDL	n/a	
lexachlorobutadiene	BDL	BOL	
,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
richlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	BDL	10
,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
,2-Dichloroethane	n/a	BDL	
,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
,2-Dichloropropane	n/a	BDL	
richloroethene	n/a	BDL	
Promodichloromethane	n/a	BDL	
,1,2-Trichloroethane	n/a	BDL	
,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
,2-dibromomethane	n/a	BDL	
,1,1,2-Tetrachioroethane	n/a	BDL	
Bromoform	n/a - '-	BDL	
1,43	n/a	BDL	
2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:027S000201 Lab File ID:NAS194.001 Calibration Std.:vc0606.001 Date: 06/06/95 Blank: blk0606.001 Dilution:

on:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen
/inyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
,1-Dichloropropene	BDL.	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
-1,3-Dichloropropene	BDL	BDL	
Foluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
n,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
>Xylene	BDL	n/a	
BFB (surrogate)	61.6	41.1	
0,42	BDL BDL	n/a	
-Propylbenzene	BDL BDL	n/a	
-Propyiberizerie -Chlorotoluene	BDL	BDL	
-Chlorotoluene	BDL	BDL	
	BDL BDL	n/a	
,3,5-Trimethylbenzene	BDL	•	
Butylbenzene		n/a	
,2,4-Trimethylbenzene	BDL	n/a	
-butylbenzene/1,3-DCB	BDL	n/a	
,4-Dichlorobenzene	BDL	BDL	
-Isopropyitoluene	BDL	n/a	
,2-Dichlorobenzene	BDL	BDL	
-Butyibenzene	BDL	n/a	
,2,4-Trichlorobenzene	BDL	BDL	
laphthalene	BDL	n/a	
lexachlorobutadiene	BDL	BDL	
,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
3romomethane	n/a	BDL	
Chloroethane	n/a	BDL	
richlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	15	10
,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BOL	
Chloroform	n/a	BDL	
,2-Dichloropropane	n/a	BDL	
,2-Dichloroethane	n/a	BDL	
,1,1-Trichloroethane	n/a	BOL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
,2-Dichloropropane	n/a	BOL	
richloroethene	n/a	BOL	
Promodichloromethane	n/a	BDL	
.1.2-Trichloroethane	n/a	BDL	
,3-Dichloropropene	n/a	BDL	
,3-Dichloropropene Dibromochloromethane	n/a. n/a.	BDL	
.2-dibromomethane			
,1,1,2-Tetrachloroethane	n/a	BDL	
• • •	n/a	BDL	
Bromoform	n/a	BDL BDL	
31,43	n/a	BDL	

Sample Location:027S000206 Lab File ID:NAS192.001 Calibration Std.:vc0606.001 Date: 06/06/95 Blank: blk0606.001 Dilution:

ution:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
/inyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	75.5	64.8	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
I 4-Dichlorobenzene	BDL	BDL	
o-Isopropyitoluene	BDL	n/a	
,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BOL	BDL	
1.2.3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	1.1	10
1.1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1.2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachioroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
11,740	n/a	BDL	

Sample Location:027S000212 Lab File ID:NAS193.001 Calibration Std.:vc0606.001

Date: 06/06/95 Blank: blk0606.001 Dilution:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	8DL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	79.3	65.3	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BOL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BOL	n/a	
Hexachlorobutadiene	BOL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL BDL	
Chloroethane Trichlorofluoromethane	n/a	BDL	
	n/a n/a	10	10
Methylenechloride 1,1-Dichloroethane	n/a	BDL	10
Bromochloromethane	n/a.	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1.1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1.2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
The state of the s			
41,43	n/a	BDL	

Sample Location:027G000244 Lab File ID:NAS197.WKS Calibration Std.:vc0607.001

Date: 06/07/95 Blank: blk0607.001 Dilution:

	Concen.	Concen.	Blank
Compound	PiD (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BOL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	93.8	92.5	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BOL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	BDL	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a.	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:027G000244 Lab File ID:NAS197.WKS Calibration Std.:vc0607.001 Date: 06/07/95 Blank: blk0607.001 Dilution:

n:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BOL	
t,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	93.8	92.5	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chiorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyitoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	BDL	11
1.1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
	n/a.	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene Bromodichloromethane	n/a n/a	BDL	
	n/a. n/a	BDL	
1,1,2-Trichloroethane			
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
		DDI	
Bromoform 41,43	n/a n/a	BDL BDL	

Sample Location:027S000301 Lab File ID:NAS197.WKS Calibration Std.:vc0607.001 Date: 06/07/95 Blank: blk0607.001 Dilution:

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Computition	FID (ppb)	riaii (ppb)	CONCERT.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BOL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	57.8	40.6	
40,42	5.8	n/a	
n-Propylbenzene	BDL	п/а	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-IsopropyItoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL BDL	
Dichlorofluoromethane	n/a	BDL BDL	
Bromomethane Chloroethane	n/a n/a	BDL	
Chioroemane Trichlorofluoromethane	n/a.	BDL.	
Methylenechloride	n/a	17	11
1,1-Dichloroethane	n/a	BDL	• •
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachioroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:027S000306 Lab File ID:NAS206.001 Calibration Std.:vc0607.001 Date: 06/07/95 Blank: blk0607.001 Dilution:

ion.

Compound	Concen. PID (ppb)	Concen. Hail (ppb)	Blank Concen.
	, 15 (ppb)	- iai (ppu)	
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BOL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a ,	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a -/-	
o-Xylene BFB (surrogate)	BDL 71.7	n/a 60.5	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a n/a	
2-Chlorotoluene	BDL	BOL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-isopropyitoluene	BDL.	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BOL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	11	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL.	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL BDL	
1,2-Dichloropropane Trichloroethene	n/a		
Bromodichloromethane	n/a n/a	BDL BDL	
1,1,2-Trichloroethane	n/a n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL BDL	
Bromoform	n/a	BDL	
41,43	п/а	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

~ . 1 Sample Location:027S000312 Lab File ID:NAS199.001 Calibration Std.:vc0607.001

1,2-Dibromo-3-chtoropropene

Date: 06/07/95 Blank: blk0607.001 Dilution:

Concen. Concen. Blank PID (ppb) Hail (ppb) Concen. Compound Vinyl Chloride BDL BDL BDL 1,1-Dichloroethene BDL t-1,2-Dichloroethene BDL BDL c-1,2-Dichloroethene BDL BDL BDL BDL 1,1-Dichloropropene Benzene BDL n/a Trichloroethene BDL BDL BDL BDL c-1,3-Dichloropropene BOL. BDL t-1,3-Dichloropropene Toluene BDL n/a Tetrachloroethene BDL BDI BDL. BDL Chlorobenzene Ethylbenzene BDL n/a m,p-Xylenes BDL n/a BDL n/a Styrene **BDL** o-Xylene n/a 70.4 BFB (surrogate) 73.3 40,42 BDL n/a BDL n-Propyibenzene n/a 2-Chlorotoluene BDL BDL 4-Chlorotoluene BDL BDL 1,3,5-Trimethylbenzene BDL n/a t-Butylbenzene BDL n/a 1,2,4-Trimethylbenzene BDL n/a s-butylbenzene/1,3-DCB BDL n/a BDL BDL 1,4-Dichlorobenzene p-isopropyltoluene BDL n/a BDL BDL 1,2-Dichlorobenzene n-Butylbenzene BDL n/a 1,2,4-Trichlorobenzene BDL BDL BDL Naphthalene n/a BDL BDL Hexachlorobutadiene 1,2,3-Trichlorobenzene BDL BDL BDL Dichlorofluoromethane n/a BDL n/a Bromomethane BDL Chloroethane n/a Trichlorofluoromethane n/a BDL Methylenechloride 11 11 n/a 1.1-Dichloroethane BDL n/a Bromochloromethane n/a BDL BDL Chloroform n/a BDL 2,2-Dichloropropane n/a 1,2-Dichloroethane n/a BDL **BDL** 1,1,1-Trichloroethane n/a BDL Carbon Tetrachloride n/a BDL Dibromomethane n/a 1,2-Dichloropropane n/a BDL BDL Trichloroethene n/a BDL Bromodichloromethane n/a 1,1,2-Trichloroethane BDL n/a 1,3-Dichloropropene n/a BDL Dibromochloromethane n/a BDL BDL 1,2-dibromomethane n/a 1,1,1,2-Tetrachloroethane n/a BDL BDI Bromoform n/a 41,43 n/a BDL

n/a

BDL

Sample Location:027S000401 Lab File ID:NAS207.001 Calibration Std.:vc0607.001 Date: 06/07/95 Blank: blk0607.001 Dilution:

ution:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	60.6	44.9	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichtorofluoromethane	n/a	BDL	
Methylenechloride	n/a	15-	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a.	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/ a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,2-dibromomethane 1,1,1,2-Tetrachloroethane	n/a n/a	BDL BDL	
Bromoform	n/a. n/a.	BDL	
41,43	n/a.	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	
.,2 Dibrotto-o-cittoroproperie	11/4	DDL	

Sample Location:027S000406 Lab File ID:NAS203.001 Calibration Std.:vc0607.001 Date: 06/07/95 Blank: blk0607.001 Dilution:

n:

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	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL.	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	8DL	n/a	
BFB (surrogate)	76	69.7	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-isopropyitoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	п/а	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichiorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	1.1.	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichtoropropene	n/a	BDL	
Dibromochloromethane	n/a.	BDL	
1,2-dibromomethane	n/a	BDL	
1.1.1.2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
11114	n/a	BDL	

Sample Location:027S000412 Lab File ID:NAS208.001 Calibration Std.:vc0607.001

Date: 06/07/95 Blank: blk0607.001 Dilution:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
/inyl Chloride	BDL	BDL	
,1-Dichloroethene	BOL	BOL	
-1,2-Dichloroethene	BDL	BDL	
:-1,2-Dichloroethene	BDL	BDL	
,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Frichloroethene	BDL	BDL	
:-1,3-Dichloropropene	BDL	BDL	
-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
n,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
x-Xylene	BDL	n/a	
BFB (surrogate)	70.8	64.9	
10,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
1-Chlorotoluene	BDL	BDL	
,3,5-Trimethylbenzene	BDL	n/a	
-Butylbenzene	BDL	n/a	
,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
4-Dichlorobenzene	BDL	BDL	
o-Isopropyltoluene	BDL	n/a	
,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
.2.3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Frichtorofluoromethane	n/a	BDL	
Methylenechloride	n/a	11.	11
.1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
,2-Dichloroethane	n/a	BDL	
.1.1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
,2-Dichloropropane	n/a	BDL	
richloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
,2-dibromomethane	n/a	BDL	
	11/4		
	n/a	RDI	
,1,1,2-Tetrachloroethane	n/a n/a	BDL BDI	
	n/a n/a n/a	BDL BDL BDL	

Sample Location:027S000501 Lab File ID:NAS204.001 Calibration Std.:vc0607.001 Date: 06/07/95 Blank: blk0607.001 Dilution:

ution:

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	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	69.1	60.5	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyitoluene	BDL	n/a	
1,2-Dichtorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	4.4
Methylenechloride	n/a.	BDL	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a.	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL BDL	
Dibromomethane	n/a	BOL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BOL BOL	
1,1,2-Trichloroethane	n/a		
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a.	BDL	
Bromoform	n/a.	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:027S000506 Lab File ID:NAS201.001 Calibration Std.:vc0607.001

Date: 06/07/95 Blank: blk0607.001 Dilution:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
	((() () ()	(FF-)	
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	80.2	75.7	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-isopropyitoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL BDL	n/a BDL	
1,2,4-Trichlorobenzene	BDL	n/a	
Naphthalene Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	11.	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a.	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	8DL	
Bromodichloromethane	n/a	8DL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochtoromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory Analytical Data - Volatile Organic Compounds Memphis Naval Air Station

Sample Location:027S000512 Lab File ID:NAS202.001 Calibration Std.:vc0607.001 Date: 06/07/95 Blank: blk0607.001 Dilution:

Vinyl Chloride ,1-Dichloroethene -1,2-Dichloroethene -1,2-Dichloroethene -1,2-Dichloropropene Benzene Frichloroethene -1,3-Dichloropropene -1,3-Dichloropropene Fetrachloroethene -1,3-Dichloropropene Fetrachloroethene Entrylbenzene Entrylbenzene Entrylbenzene -2-Chlorobenzene -3-BB (surrogate) -3-Propylbenzene -3-Chlorotoluene -3-Chlorotoluene -3-Chlorotoluene -3-Chlorotoluene -3-Chlorotoluene -3-Dichloropene -	PID (ppb) 3DL 3DL 3DL 3DL 3DL 3DL 3DL 3D	Hall (ppb) BDL BDL BDL BDL BDL BDL BDL BDL BDL BD	Concen.
1.1-Dichloroethene -1,2-Dichloroethene -1,2-Dichloroethene -1,2-Dichloropropene Benzene Frichloroethene -1,3-Dichloropropene E-1,3-Dichloropropene E-1,3-Dichloropropene E-1,3-Dichloropropene E-1,3-Dichloropropene E-1,3-Dichloropropene E-1,3-Dichloropropene E-1,3-Dichloropropene E-1,3-Dichloropropene E-1,3-Dichloropropene E-1,1-Dichloropropene E-1,1-Dichloropropene E-1,2-Vienes E-1,2-Vienes E-1,2-Vienes E-1,3-E-1,3-Dichloropropene E-1,2-1,3-Trimethylbenzene E-1,2-1,3-Trimethylbenzene E-1,2-1,3-Trimethylbenzene E-1,2-1,3-Trichlorobenzene E-1,3-Dichloropene E-1,3-Dichloropene E-1,3-Dichlorobenzene E-1,3-Dichlor	8DL 8DL 8DL 8DL 8DL 8DL 8DL 8DL	BDL BDL BDL n/a BDL BDL n/a BDL n/a BDL n/a	
-1,2-Dichloroethene -1,2-Dichloroethene -1,2-Dichloropropene Benzene Frichloroethene -1,3-Dichloropropene Foluene Fetrachloroethene -1,3-Dichloropropene Fetrachloroethene Chlorobenzene Ethylbenzene m,p-Xylenes Styrene -2-Xylene BFB (surrogate) -2-Chlorotoluene -3-Chlorotoluene -3-Chlorothane -3-Chlorofluoromethane -3-Chlorothane -3-Chlorothane -3-Chlorotoluene -3-Chlorotoluene -3-Chlorothane -3-Chlorotoluene -3-Chlorothane -3-Chlorotoluene -3-Chlorothane -3-Chlorotoluene -3-Chlorothane -3-Chlorotoluene -3-Chlorothane -3-Chlorotoluene -3-Chlorotoluene -3-Chlorothane -3-Chlorotoluene -3-Chlorotoluene -3-Chlorotoluene -3-Chlorotoluene -3-Chlorotoluene -3-Chlorotoluene -3-Chlorothane -3-Chlorotoluene -3-Chlorotolue	3DL 3DL 3DL 3DL 3DL 3DL 3DL 3DL	BDL BDL n/a BDL BDL n/a BDL n/a BDL n/a	
2-1,2-Dichloroethene 3-1,2-Dichloropropene 3-1,3-Dichloropropene 3-1,3-Dichloropropene 3-1,3-Dichloropropene 3-1,3-Dichloropropene 3-1,3-Dichloropropene 3-Dichloropropene 3-Dichlorobenzene 3-Dichlorobenzene 3-Dichlorobenzene 3-Dichlorobenzene 3-Styrene 3-Styrene 3-Styrene 3-Styrene 3-Styrene 3-Styrene 3-Chlorotoluene 3-Chlorotoluene 3-Chlorotoluene 3-Chlorotoluene 3-Chlorotoluene 3-Chlorotoluene 3-Dichlorobenzene 3-Dichlorobenzene 3-Dichlorobenzene 3-Dichlorobenzene 3-Dichlorobenzene 3-Dichlorobenzene 3-Dichlorobenzene 3-Styrichlorobenzene 3-Dichlorofluoromethane 3-Gromomethane 3-Grom	8DL 8DL 8DL 8DL 8DL 8DL 8DL 8DL	BDL BDL n/a BDL BDL n/a BDL BDL n/a BDL n/a n/a n/a n/a n/a n/a n/a n/a n/a BDL BDL n/a n/a BDL BDL n/a BDL n/a BDL BDL n/a BDL n/a BDL n/a BDL n/a BDL n/a BDL BDL n/a BDL	
.1-Dichloropropene Genzene Frichloroethene -1,3-Dichloropropene Foliuene Fetrachloroethene Chlorobenzene Ethylbenzene Ethy	8DL 8DL 8DL 8DL 8DL 8DL 8DL 8DL	BDL n/a BDL BDL n/a BDL BDL n/a BDL n/a n/a n/a n/a n/a n/a n/a n/a BDL n/a BDL n/a	
Genzene Frichloroethene Frichloroethene Frichloropropene Frichloropropene Frichloroethene Frichlorobenzene Fetrachloroethene Chlorobenzene Ethylbenzene Frichlorobenzene Frichlorobenzene Frichlorobenzene Frichlorotoluene Frichlorotoluene Frichlorotoluene Frichlorobenzene Frichlorobenzene Frichlorobenzene Frichlorobenzene Frichlorobenzene Frichlorobenzene Frichlorobenzene Frichlorobenzene Frichlorofluoromethane Frichlorofluoromethane Frichlorotoluene Frichlorotoluene Frichlorofluoromethane Frichlorofluoromethane Frichlorofluoromethane Frichlorobenzene Frichlorobenzene Frichlorofluoromethane Frichlorofluoromethane Frichlorofluoromethane Frichlorofluoromethane Frichlorofluoromethane Frichlorofluoromethane Frichlorofluoromethane Frichlorofluoromethane Frichlorofluoromethane Frichloroform Frich	8DL 8DL 8DL 8DL 8DL 8DL 8DL 8DL	n/a BDL BDL n/a BDL n/a BDL n/a n/a n/a n/a 75.3 n/a n/a BDL n/a a BDL n/a BDL n/a BDL n/a BDL n/a n/a BDL n/a BDL n/a	
Frichloroethene 2-1,3-Dichloropropene 3-1,3-Dichloropropene Foluene Fetrachloroethene Chlorobenzene Ethylbenzene Ethylbenzene Ethylbenzene Ethylopropene Ethylbenzene Ethylben	8DL 8DL 8DL 8DL 8DL 8DL 8DL 8DL	BDL BDL n/a BDL n/a BDL n/a n/a n/a n/a 75.3 n/a n/a BDL BDL n/a a BDL n/a n/a BDL n/a n/a BDL n/a n/a	
2-1,3-Dichloropropene 2-1,3-Dichloropropene Foluene Foluene Foluene Foluene Foliopene Foliopene Ethylbenzene	8DL 8DL 8DL 8DL 8DL 8DL 8DL 8DL	BDL BDL n/a BDL n/a n/a n/a n/a 75.3 n/a n/a BDL BDL n/a n/a BDL n/a n/a n/a BDL n/a n/a	
-1,3-Dichloropropene Foluene Foluene Fetrachloroethene Chlorobenzene Ethylbenzene In,p-Xylenes Styrene D-Xylene SFB (surrogate) IO,42 In-Propylbenzene I-Chlorotoluene I-Chlorotoluene I-Chlorotoluene II,3,5-Trimethylbenzene II,2,4-Trimethylbenzene II,2-Dichlorobenzene II,2-Dichlorobenzene II,2-J-Trichlorobenzene II,2,3-Trichlorobenzene II,2,3-Trichlorobenzene III,2,3-Trichlorobenzene III,2,3-Trichlorobenzene IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	8DL 8DL 8DL 8DL 8DL 8DL 8DL 8DL	BDL n/a BDL n/a n/a n/a n/a n/a n/a 75.3 n/a n/a BDL BDL n/a n/a n/a n/a BDL n/a n/a BDL n/a n/a BDL n/a BDL n/a	
Foluene Fetrachloroethene Chlorobenzene Ethylbenzene Ethylbenzene En,p-Xylenes Styrene D-Xylene SFB (surrogate) Foliorotoluene	8DL 8DL 8DL 8DL 8DL 8DL 8DL 8DL	n/a BDL n/a n/a n/a n/a n/a 75.3 n/a n/a BDL BDL n/a n/a n/a n/a BDL n/a n/a BDL n/a BDL n/a BDL n/a BDL	
Fetrachloroethene Chlorobenzene Ethylbenzene Ethylbenzene En,p-Xylenes Styrene D-Xylene SFB (surrogate) FF (sur	8DL 8DL 8DL 8DL 8DL 8DL 8DL 8DL 8DL 8DL	BDL n/a n/a n/a n/a n/a 75.3 n/a n/a BDL BDL n/a n/a n/a n/a n/a BDL n/a n/a BDL n/a n/a BDL	
Chlorobenzene Ethylbenzene In,p-Xylenes Styrene Styren	8DL 8DL 8DL 8DL 8DL 8DL 8DL 8DL 8DL 8DL	BDL n/a n/a n/a n/a 75.3 n/a n/a BDL BDL n/a n/a n/a n/a n/a BDL n/a n/a BDL n/a BDL n/a BDL	
Ethylbenzene m.p-Xylenes Styrene D-Xylene SEB (surrogate) 10,42 E-Chlorotoluene 1-Chlorotoluene 1-Sutylbenzene E-Butylbenzene 1-Sutylbenzene 1-Suty	8DL 8DL 8DL 8DL 8DL 8DL 8DL 8DL 8DL 8DL	n/a n/a n/a n/a 75.3 n/a n/a BDL BDL n/a n/a n/a n/a n/a BDL n/a n/a BDL	
m.p-Xylenes Styrene St	8DL 8DL 8DL 8DL 8DL 8DL 8DL 8DL 8DL 8DL	n/a n/a n/a 75.3 n/a n/a BDL BDL n/a n/a n/a n/a n/a n/a BDL n/a BDL	
Styrene Styrene Styrene Stylene Stylen	80L 80L 80L 80L 80L 80L 80L 80L 80L 80L	n/a n/a 75.3 n/a n/a BDL BDL n/a n/a n/a n/a n/a n/a BDL n/a BDL n/a BDL	
p-Xylene 3FB (surrogate) 30,42 510,42 52-Chlorotoluene 53-Chlorotoluene 54-Chlorotoluene 54-Chlorotoluene 54-Chlorotoluene 54-Chlorotoluene 65-Butylbenzene 66-Butylbenzene 67-Butylbenzene 67-Chlorobenzene 68-Butylbenzene/1,3-DCB 68-Butylbenzene/1,3-DCB 68-Butylbenzene 69-Chlorobenzene 69-Chlorobenzene 69-Chlorobenzene 69-Chlorobenzene 69-Chlorobenzene 69-Chlorobenzene 69-Chlorobenzene 69-Chlorofluoromethane 69-Chloroethane 69-Chloroethane 69-Chlorobethane 69-Chlorobethane 69-Chlorobethane 69-Chlorofluoromethane 69-Chlorofluoromethane 69-Chlorofluoromethane 69-Chlorofluoromethane 69-Chlorofluoromethane 69-Chlorofluoromethane 69-Chlorofluoromethane 69-Chloroform 69-Ch	80L 83.3 80L 80L 80L 80L 80L 80L 80L 80L 80L	n/a 75.3 n/a n/a BDL BDL n/a n/a n/a n/a n/a n/a BDL n/a BDL n/a BDL	
3FB (surrogate) 30,42 510,42 52-Chlorotoluene 53-Chlorotoluene 54-Chlorotoluene 54-Chlorotoluene 54-Chlorotoluene 55-Butylbenzene 55-Butylbenzene 55-Butylbenzene 56-Butylbenzene 57-Chlorobenzene 58-Butylbenzene 58-Butylbenzene 59-Isopropyltoluene 69-Isopropyltoluene	78.3 30L 30L 30L 30L 30L 30L 30L 30L 30L 30	75.3 n/a n/a BDL BDL n/a n/a n/a n/a n/a BDL n/a BDL n/a BDL	
3FB (surrogate) 30,42 50,42 510,42 52-Chlorotoluene 53-Chlorotoluene 64-Chlorotoluene 65-Chlorotoluene 65-Butylbenzene 65-Butylbenzene 65-Butylbenzene 65-Butylbenzene 65-Butylbenzene 66-Butylbenzene 67-Butylbenzene 68-Butylbenzene 69-Isopropyltoluene 69-Isopropyltol	80L 80L 80L 80L 80L 80L 80L 80L 80L	75.3 n/a n/a BDL BDL n/a n/a n/a n/a n/a BDL n/a BDL n/a BDL	
an-Propylbenzene 2-Chlorotoluene 3-Chlorotoluene 4-Chlorotoluene 4-Chlorotoluene 5-Butylbenzene 1,2,4-Trimethylbenzene 8-butylbenzene/1,3-DCB 1,4-Dichlorobenzene 1,2-Dichlorobenzene 8-Butylbenzene 1,2-Dichlorobenzene 8-Butylbenzene 1,2-Dichlorobenzene 8-Butylbenzene 1,2-Trichlorobenzene 1,2,4-Trichlorobenzene 8-Butylbenzene 1,2,4-Trichlorobenzene 8-Butylbenzene 1,2,4-Trichlorobenzene 8-Butylbenzene 1,2-Trichlorobenzene 1,2-Trichlorobenzene 1,1-Trichlorobenzene 1,2-Trichlorobenzene 1,2-Tr	80L 80L 80L 80L 80L 80L 80L 80L 80L	n/a BDL BDL n/a n/a n/a BDL n/a BDL	
n-Propylbenzene 2-Chlorotoluene 3-Chlorotoluene 3-Chlorotoluene 4-Chlorotoluene 4-Sutylbenzene 5-Butylbenzene 6-Butylbenzene 6-Butylbenzene/1,3-DCB 6-L-Dichlorobenzene 6-Disopropyltoluene 6-Chlorobenzene 6-Butylbenzene 6-Butylbenzene 6-Butylbenzene 6-Butylbenzene 6-Butylbenzene 6-Butylbenzene 6-Chlorobenzene 6-Chlorobenzene 6-Chlorofluoromethane 6-Chloroform 6-Chloro	80L 80L 80L 80L 80L 80L 80L 80L 80L	n/a BDL BDL n/a n/a n/a BDL n/a BDL	
2-Chlorotoluene 3-Chlorotoluene 4-Chlorotoluene 5-Butylbenzene 6-Butylbenzene 6-Butylbenzene 6-Butylbenzene 6-Butylbenzene 6-Butylbenzene/1,3-DCB 6-L-Dichlorobenzene 6-Butylbenzene 6-But	80L 80L 80L 80L 80L 80L 80L 80L	BDL n/a n/a n/a n/a BDL n/a BDL	
A-Chlorotoluene 1,3,5-Trimethylbenzene -Butylbenzene 1,2,4-Trimethylbenzene 8-butylbenzene/1,3-DCB 1,4-Dichlorobenzene -Isopropyltoluene 1,2-Dichlorobenzene 1,2,4-Trichlorobenzene 8-butylbenzene 1,2,4-Trichlorobenzene 1,2,4-Trichlorobenzene 1,2,3-Trichlorobenzene 1,2,3-Trichlorobenzene 1,2,3-Trichlorobenzene 1,2,3-Trichlorobenzene 1,2,1-Dichloromethane 1,1-Dichloroethane 1,1-Dichloroethane 1,1-Dichloroethane 1,2-Dichloroptopopane 1,2-Dichloroptopopane 1,2-Dichloroethane	BOL BOL BOL BOL BOL BOL BOL	BDL n/a n/a n/a n/a BDL n/a BDL	
1,3,5-Trimethylbenzene -Butylbenzene 1,2,4-Trimethylbenzene 8-butylbenzene/1,3-DCB 1,4-Dichlorobenzene 0-Isopropyltoluene 1,2-Dichlorobenzene 1,2,4-Trichlorobenzene 8-butylbenzene 1,2,4-Trichlorobenzene 8-butylbenzene 1,2,4-Trichlorobenzene 1,2,3-Trichlorobenzene 0-Ichlorofluoromethane 1,2,3-Trichlorobenzene 0-Ichlorofluoromethane 1,1-Dichlorobenzene 1,1-Dichloroethane 1,1-Dichloroethane 1,1-Dichloromethane 1,2-Dichloropropane 1,2-Dichloropropane 1,2-Dichloroethane 1,1-Dichloropropane 1,2-Dichloroethane 1,1-Dichloropropane 1,2-Dichloroethane 1,1-Dichloropropane 1,2-Dichloroethane 1,1-Dichloropropane 1,2-Dichloroethane 1,1-Dichloropropane 1,2-Dichloroethane 1,1-Dichloropropane 1,2-Dichloroethane 1,2-Dichloropropane 1,2-Dichloroethane 1,2-Dichloropropane 1,2-Dichloroethane 1,2-Dichlo	BDL BDL BDL BDL BDL BDL	n/a n/a n/a BDL n/a BDL	
-Butylbenzene	BDL BDL BDL BDL BDL BDL	n/a n/a n/a BDL n/a BDL	
1,2,4-Trimethylbenzene 1,4-Dichlorobenzene 1,4-Dichlorobenzene 1,2-Dichlorobenzene 1,2,4-Trichlorobenzene 1,2,4-Trichlorobenzene 1,2,4-Trichlorobenzene 1,2,4-Trichlorobenzene 1,2,3-Trichlorobenzene 1,2,3-Trichlorobenzene 1,1,3-Trichlorobenzene 1,1,1-Trichlorobenzene 1,1,1-Trichlorobenzene 1,1,1-Trichlorobenzene 1,1-Trichlorobenzene 1,1-Dichloromethane 1,1-Dichloroethane 1,1-Dichloroethane 1,1-Dichloroethane 1,2-Dichloropropane 1,2-Dichloropropane 1,2-Dichloroethane 1,1-Dichloroethane 1,1-Dichloropropane 1,2-Dichloroethane 1,1-Dichloropropane 1,2-Dichloroethane 1,1-Dichloroethane 1,2-Dichloroethane 1,2-Dichloroetha	BDL BDL BDL BDL	n/a n/a BDL n/a BDL	
S-butylbenzene/1,3-DCB 1,4-Dichlorobenzene 2,2-Dichlorobenzene 3,2,4-Trichlorobenzene 4,2,4-Trichlorobenzene 5,2,4-Trichlorobenzene 6,2,3-Trichlorobenzene 6,2,3-Trichlorobenzene 7,1,3-Trichlorobenzene 8,1,2,3-Trichlorobenzene 9,1,2,3-Trichlorobenzene 1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1	BDL BDL BDL BDL	n/a BDL n/a BDL	
1,4-Dichlorobenzene 2-Isopropyltoluene 1,2-Dichlorobenzene 1,2,4-Trichlorobenzene 1,2,4-Trichlorobenzene 1,2,3-Trichlorobenzene 2-Isopropyltoluene 3-Isopropyltoluene	BDL BDL BDL BDL	BDL n/a BDL	
p-Isopropyltoluene 1,2-Dichlorobenzene 1,2,4-Trichlorobenzene 1,2,4-Trichlorobenzene 1,2,4-Trichlorobenzene 1,2,3-Trichlorobenzene 1,2,3-Trichlorobenzene 1,2,3-Trichlorobenzene 1,1,0-Oichloromethane 1,1-Dichloroethane 1,1-Dichloroethane 1,2-Dichloropropane 1,2-Dichloropropane 1,2-Dichloroethane 1,	BDL BDL BDL	n/ a BDL	
1,2-Dichlorobenzene 1-Butylbenzene 1-Butylbenzene 1,2,4-Trichlorobenzene 1,2,4-Trichlorobenzene 1,2,3-Trichlorobenzene 1,2,3-Trichlorobenzene 1,2,3-Trichlorobenzene 1,1-Dichloromethane 1,1-Dichloroethane 1,1-Dichloroethane 1,2-Dichloropropane 1,2-Dichloropropane 1,2-Dichloroethane 1,2-Dichloroetha	BDL BDL	BDL	
n-Butylbenzene E 1,2,4-Trichlorobenzene E Naphthalene E Hexachlorobutadiene E 1,2,3-Trichlorobenzene E Dichlorofluoromethane r Chloroethane r Methylenechloride r 1,1-Dichloroethane r Chloroform r 2,2-Dichloropropane r 1,2-Dichloroethane r	BDL		
1,2,4-Trichlorobenzene Naphthalene Hexachlorobutadiene 1,2,3-Trichlorobenzene Dichlorofluoromethane Chloroethane Frichlorofluoromethane Methylenechloride 1,1-Dichloroethane Chloroform Chloroform Chloroform Chloroform Chloropropane Chloropropane Chlorocethane Chloroform Chloropropane Chlorocethane Chloroform Chloropropane Chloroforomethane Chloroform Chloroform Chloropropane Chloroforomethane Chloroform Chloropropane Chloroforomethane Chloroforomethane Chloroforomethane Chloroforomethane Chloroforomethane			
Naphthalene E Hexachlorobutadiene E 1,2,3-Trichlorobenzene E Dichlorofluoromethane r Gromomethane r Chloroethane r Methylenechloride r 1,1-Dichloroethane r Chloroform r 2,2-Dichloropropane r 1,2-Dichloroethane r 1,2-Dichloroethane r 1,2-Dichloroethane r 1,2-Dichloroethane r 1,2-Dichloroethane r 1,2-Dichloroethane r		BDL	
Hexachlorobutadiene 1,2,3-Trichlorobenzene Dichlorofluoromethane Chloroethane Frichlorofluoromethane Methylenechloride 1,1-Dichloroethane Chloroform Chloroform 1,2-Dichloropropane 1,2-Dichloroethane	BDL	n/a	
1,2,3-Trichlorobenzene Dichlorofluoromethane Gromomethane Chloroethane Frichlorofluoromethane Methylenechloride 1,1-Dichloroethane Gromochloromethane Chloroform 1,2-Dichloropropane 1,2-Dichloroethane	BDL	BDL	
Dichlorofluoromethane Gromomethane Chloroethane Frichlorofluoromethane Methylenechloride 1,1-Dichloroethane Gromochloromethane Chloroform 1,2-Dichloropropane 1,2-Dichloroethane	BDL	BDL	
Gromomethane r Chloroethane r Crichlorofluoromethane r Methylenechloride r I,1-Dichloroethane r Gromochloromethane r Chloroform r 2,2-Dichloropropane r I,2-Dichloroethane r	1/a	BOL	
Chloroethane r Trichlorofluoromethane r Methylenechloride r 1,1-Dichloroethane r Bromochloromethane r Chloroform r 2,2-Dichloropropane r 1,2-Dichloroethane r	1/a	BDL	
Frichlorofluoromethane r Methylenechloride r 1,1-Dichloroethane r Bromochloromethane r Chloroform r 2,2-Dichloropropane r 1,2-Dichloroethane r	1/a 1/a	BDL	
Methylenechloride r 1,1-Dichloroethane r Bromochloromethane r Chloroform r 2,2-Dichloropropane r 1,2-Dichloroethane r	1/a 1/a	BDL	
1,1-Dichloroethane r Bromochloromethane r Chloroform r 2,2-Dichloropropane r 1,2-Dichloroethane r	1/a 1/a	11	11
Bromochloromethane r Chloroform r 2,2-Dichloropropane r ,2-Dichloroethane r	1/a 1/a	BDL	
Chloroform r 2,2-Dichloropropane r 1,2-Dichloroethane r	1/a 1/a	BDL BDL	
2,2-Dichloropropane r 1,2-Dichloroethane r	1/a 1/a	BDL BDL	
1,2-Dichloroethane r		BDL	
	1/a 1/a	BDL BDL	
l 1 1- irichioroethene	1/a 1/a	BDL	
	1/a. 1/a.	BDL	
	1/a 1/a	BDL	
	1/a 1/a	BDL	
		BDL	
	1/a 1/a		
	n/a	BDL BDL	
• •	1/a		
		BDL	
	1/a		
	ı/a	BDL	
	n/a n/a	BDL	
	n/a n/a n/a	BDL BDL	
11,43 r I,2-Dibromo-3-chloropropene r	n/a n/a n/a n/a	BDL	

Sample Location:027G000545 Lab File ID:NAS198.001 Calibration Std.:vc0607.001 Date: 06/07/95 Blank: blk0607.001 Dilution:

ion:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hali (ppb)	Concen.
 Viny! Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BOL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichtoropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BOL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	82.7	84.5	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BOL	n/a	
t-Butylbenzene	BOL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BOL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	BDL	11
1,1-Dichtoroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL.	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichtoroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachioroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:027S000601 Lab File ID:NAS210.001 Calibration Std.:vc0607.001 Date: 06/07/95 Blank: blk0607.001 Dilution:

on:

	Concen.	Concen.	Blank
Compound	PłD (ppb)	Hall (ppb)	Concen.
/inyl Chloride	BDL	BDL	-
,1-Dichloroethene	BDL	BDL	
-1,2-Dichloroethene	BDL	BDL	
-1,2-Dichloroethene	BDL	BDL	
,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
richloroethene	8DL	BDL	
-1,3-Dichloropropene	BDL	BDL	
-1,3-Dichloropropene	BDL	BDL	
oluene	BDL	n/a	
etrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
thylbenzene	BDL	n/a	
n,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
-Xylene	BOL	n/a	
-xylene SFB (surrogate)	51.1	71/a. 34.1	
, = :	BDL		
0,42	BDL	n/a n/a	
-Propyibenzene			
2-Chlorotoluene	BDL	BDL	
I-Chlorotoluene	BDL	BDL n/n	
,3,5-Trimethylbenzene	BDL	n/a.	
-Butylbenzene	BDL	n/a ·	
,2,4-Trimethylbenzene	BDL	n/a ·	
-butylbenzene/1,3-DCB	BDL	n/a	
,4-Dichlorobenzene	BDL	BDL	
-Isopropyltoluene	BDL	n/a	
,2-Dichlorobenzene	BDL	BDL	
-Butylbenzene	BDL	n/a	
,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
lexachlorobutadiene	BDL	BDL	
,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
3romomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Frichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	16.	11
,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
,2-Dichloroethane	n/a	BDL	
.1.1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
,2-Dichloropropane	n/a	BDL	
richloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
,1,2-Trichloroethane	n/a	BDL	
	n/a	BDL	
I,3-Dichloropropene	n/a n/a	BDL	
Dibromochloromethane			
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
11,43	n/a	BDL	
,2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:027S000608 Lab File ID:NAS211.001 Calibration Std.:vc0607.001 Date: 06/07/95 Blank: blk0607.001 Dilution:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
I,1-Dichloroethene	BDL	BDL	
-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BOL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BOL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	66.4	58.1	
40,42	41.1	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BOL	
4-Chiorotoluene	BOL	BOL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-isopropyitoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachiorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	11.	11
1,1-Dichloroethane	n/a	BDL	
Bromochioromethane	n/a	BDL	
Chloroform	n/a	BDL.	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/ a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichtoropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:027S000612 Lab File ID:NAS209A.001 Calibration Std.:vc0608.001 Date: 06/08/95 Blank: blk0608.001 Dilution:

on:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hail (ppb)	Concen.
Vinyl Chloride	BDL	BDL	· · · · · · · · · · · · · · · · · · ·
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BOL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	81.1	72.8	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyitoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	BQL	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BOL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachioroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:027G000644 Lab File ID:NAS200.001 Calibration Std.:vc0607.001

Date: 06/07/95 Blank: blk0607.001 Dilution:

on:

0	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	·
1,1-Dichloroethene	80L	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachioroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	81.5	86.9	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chiorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BOL	BDL	
p-isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	8DL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	BQL	11
1,1-Dichloroethane	n/a.	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BOL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a - /-	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
D 4			
Bromoform 41,43	n/a n/a	BDL BDL	

" . 1 Sample Location:027S000701 Lab File ID:NAS212.001 Calibration Std.:vc0607.001 Date: 06/07/95 Blank: blk0607.001 Dilution:

tion:

	Concen.	Concen.	Blank
Compound	PiD (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BOL	
t-1,2-Dichloroethene	BDL	BOL	
c-1,2-Dichloroethene	BDL	BDL	
	BDL	BDL	
1,1-Dichloropropene	BDL	n/a	
Benzene Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BOL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL BDL	n/a	
•		· ·	
o-Xylene REB (surrogate)	BDL 65.5	n/a 57	
BFB (surrogate) 40.42	BDL	n/a	
,	BDL	n/a n/a	
n-Propylbenzene 2-Chlorotoluene	BDL BDL	n/a BDL	
4-Chlorotoluene	BDL	BDL	
		n/a	
1,3,5-Trimethylbenzene	BDL		
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a BDI	
1,4-Dichlorobenzene	BDL	BDL a/a	
p-Isopropyltoluene	BDL BDL	n/a BDL	
1,2-Dichlorobenzene			
n-Butylbenzene	BDL	n/a BDL	
1,2,4-Trichlorobenzene	BDL		
Naphthalene	BDL BDL	n/a BDL	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene		BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a		
Trichlorofluoromethane Methylenechloride	n/a	BDL 14	11
Methylenechloride	n/a	14 BDL	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a		
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a n/a	BDL BDL	
Carbon Tetrachloride	•		
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene Promodichloromethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a - /-	BDL	
1,2-dibromomethane	n/a.	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
	-/-	PDI .	
Bromoform 41,43	n/a n/a	BDL BDL	

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Calibration Std.:vc0608.001

Date: 06/08/95 Blank: blk0608.001 Dilution:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL.	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	93.7	79.8	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL.	
p-Isopropyitoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BOL	n/a	
Hexachiorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a.	BDL	
Methylenechloride	n/a	13_	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1.2-dibromomethane	n/a.	BDL	
1,1,1,2-Tetrachioroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:027S000712 Lab File ID:NAS214.001 Calibration Std.:vc0608.001 Date: 06/08/95 Biank: blk0608.001 Dilution:

n:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	65.1	43.4	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	13	11
1,1-Dichloroethane	n/a	BDL	
Bromochioromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a.	BDL	
1,1,1-Trichloroethane	n/a.	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL BDI	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41.43	n/a	BDL	

Sample Location:027S000801 Lab File ID:NAS217.001 Calibration Std.:vc0608.001

Date: 06/08/95 Blank: blk0608.001

Dilution:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	69	51.8	
40,42	BDL	n/a	
n-Propylbenzene	BDL BDL	n/a BDL	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	n/a	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene 1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL BDL	n/a	
1,4-Dichlorobenzene	BDL.	BDI	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL BDL	BDL	
n-Butylbenzene	BOL	n/a	
1,2,4-Trichlorobenzene	BDL.	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	1.7.	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:027S000806 Lab File ID:NAS216.001 Calibration Std.:vc0608.001 Date: 06/08/95 Blank: blk0608.001 Dilution:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
/inyl Chloride	BDL	BDL	
,1-Dichloroethene	BDL	BDL	
-1,2-Dichloroethene	BDL	BDL	
-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Frichloroethene	BDL	BDL	
-1,3-Dichloropropene	BDL	BDL	
-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
n,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	80.2	63.7	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
o-isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BOL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	12.	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:027S000812 Lab File ID:NAS215.001 Calibration Std.:vc0608.001 Date: 06/08/95 Blank: blk0608.001 Dilution:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
-1,2-Dichloroethene	BDL	BDL	
-1,2-Dichloroethene	BDL	BDL	
, 1,1-Dichloropropene	BDL.	BDL	
Benzene	BOL	n/a	
Frichloroethene	BDL	BDL	
-1,3-Dichloropropene	BDL	BDL	
-1,3-Dichloropropene	BOL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
>-Xylene	BDL	n/a	
BFB (surrogate)	89.1	79.8	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-isopropyitoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	BDL	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BOL	
2,2-Dichloropropane	n/a	BOL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BOL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:027G000844 Lab File ID:NAS222.001 Calibration Std.:vc0608.001

Date: 06/08/95 Blank: blk0608.001 Dilution:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen
finyl Chloride	BDL	BDL	
,1-Dichloroethene	BOL	BDL	
1,2-Dichloroethene	BDL	BDL	
-1,2-Dichloroethene	BDL	BDL	
1-Dichloropropene	BDL	BDL	
enzene	BDL	n/a	
richloroethene	BDL	BDL	
-1,3-Dichloropropene	BDL	BDL	
1,3-Dichloropropene	BDL	BDL	
oluene	BDL	n/a	
etrachloroethene	BDL	BDL	
hlorobenzene	BDL	BDL	
thylbenzene	BDL	n/a	
n,p-Xylenes	BDL	n/a	
tyrene	BDL	n/a	
-Xyiene	BDL	n/a	
FB (surrogate)	95.2	98.7	
0,42	BDL	n/a	
-Propylbenzene	BDL	n/a	
-Chtorotoluene	BDL	BDL	
-Chlorotoluene	BDL	BDL	
3,5-Trimethylbenzene	BDL	n/a	
Butylbenzene	BDL	n/a	
,2,4-Trimethylbenzene	BDL	n/a	
-butylbenzene/1,3-DCB	BDL	n/a	
4-Dichlorobenzene	BDL	BDL	
-isopropyitoluene	BDL	n/a	
2-Dichlorobenzene	BDL	BDL	
-Butylbenzene	BDL	n/a	
,2,4-Trichlorobenzene	BDL	BDL	
laphthalene	BDL	n/a	
exachlorobutadiene	BDL	BDL	
,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Promomethane	n/a	BDL	
chloroethane	n/a	BDL	
richlorofluoromethane	n/a	BDL	14
lethylenechloride	n/a	BDL	11
,1-Dichloroethane	n/a	BDL	
romochloromethane	n/a	BDL BDL	
hloroform 2 Dichloropropens	n/a n/a		
,2-Dichloropropane	n/a.	BDL BDL	
,2-Dichloroethane ,1,1-Trichloroethane	n/a n/a	BDL	
,1,1-1richioroethane arbon Tetrachloride	n/a. n/a.	BDL	
Dibromomethane	n/a.	BDL	
	n/a.	BDL	
,2-Dichloropropane richloroethene	n/a.	BDL	
nchloroethene Bromodichloromethane	n/a. n/a	BDL	
,1,2-Trichloromethane	n/a	BDL	
	n/a	BDL	
,3-Dichloropropene Dibromochloromethane	n/a n/a	BDL	
.2-dibromomethane	n/a	BDL	
,1,1,2-Tetrachloroethane	n/a	BDL	
r, r, r, 2- retrachioroethane Bromoform	n/a	BDL	
1,43	n/a	BDL	
·			
2-Dibromo-3-chloropropene	n/a	8DL	

Sample Location:027S000901 Lab File ID:NAS218.001 Calibration Std.:vc0608.001

Date: 06/08/95 Blank: blk0608.001 Dilution:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
/inyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
-1,2-Dichloroethene	BDL	BDL	
-1,2-Dichloroethene	BDL	BDL	
,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Frichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
n,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
p-Xylene	BDL	n/a	
BFB (surrogate)	77.4	66.6	
40, 42	BDL	n/a	
n-Propylbenzene	BOL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
:-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1.4-Dichlorobenzene	BDL	BDL	
	BDL	n/a	
o-Isopropyltoluene	BDL	BDL	
1,2-Dichlorobenzene	BDL		
n-Butylbenzene		n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane -	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	4.4
Methylenechloride	n/a	15	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	

Sample Location:027S000906 Lab File ID:NAS219A.001 Calibration Std.:vc0608.001 Date: 06/08/95 Blank: blk0608.001 Dilution:

1

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hail (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
:-1,2-Dichloroethene	BDL	BDL	
:-1,2-Dichloroethene	BDL	BDL	
,1-Dichloropropene	BDL	BDL	
Benzene	BOL	n/a	
richloroethene	BDL	BDL	
-1,3-Dichloropropene	BDL	BDL	
-1,3-Dichloropropene	BDL	BDL	
oluene	BDL	n/a	
etrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
thylbenzene	BOL	n/a	
n,p-Xylenes	BDL	n/a	
tyrene	BDL	n/a	
-Xylene	BDL	n/a	
FB (surrogate)	78.1	66.7	
0,42	BDL	n/a	
-Propylbenzene	BDL	n/a	
-Chlorotoluene	BDL	BDL	
-Chlorotoluene	BDL	BDL	
,3,5-Trimethylbenzene	BDL	n/a	
Butylbenzene	BDL	n/a	
,2,4-Trimethylbenzene	BDL	n/a	
-butylbenzene/1,3-DCB	BDL	n/a	
4-Dichlorobenzene	BDL	BDL	
-isopropyltoluene	BDL	n/a	
,2-Dichlorobenzene	BDL	BDL	
-Butylbenzene	BDL	n/a	
,2,4-Trichlorobenzene	BDL	BDL	
laphthalene	BDL	n/a	
lexachlorobutadiene	BDL	BDL	
2,3-Trichlorobenzene	BDL	BDL	
ichlorofluoromethane	n/a	BDL	
romomethane	n/a	BDL	
Chloroethane	n/a	BDL	
richlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	14.	11
.1-Dichloroethane	n/a	BDL	• •
romochloromethane	n/a	BDL	
hloroform	n/a	BDL	
,2-Dichloropropane	n/a	BDL	
,2-Dichloropropane ,2-Dichloroethane	n/a	BDL BDL	
,2-Dichloroethane ,1,1-Trichloroethane	n/a n/a	BDL	
,1,1-Inchloroethane arbon Tetrachloride	n/a n/a	BDL	
Dibromomethane	n/a.	BDL	
	•	BDL	
,2-Dichloropropane	n/a		
richloroethene	n/a	BDL	
Promodichloromethane	n/a.	BDL	
,1,2-Trichloroethane	n/a.	BDL	
,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a.	BDL	
,2-dibromomethane	n/a	BDL	
,1,1,2-Tetrachloroethane	n/a	BDL	
romoform	n/a	BDL	
1,43	n/a	BDL	
2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:027S000912 Lab File ID:NAS220.001 Calibration Std.:vc0608.001 Date: 06/08/95 Blank: blk0608.001 Dilution:

on:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hail (ppb)	Concen.
Vinyl Chloride	BDL	BDL	··
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-\$,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	90.9	105	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-isopropyitoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	9_	11
1.1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichtoropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a.	BDL BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
richioroethene Bromodichloromethane	n/a.	BDL	
	n/a. n/a.	BDL	
1,1,2-Trichloroethane	-		
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL BDL	
1,1,1,2-Tetrachioroethane	n/a	BDL	
Bromoform	n/a - /-	BDL	
41,43	n/a	BDL	

Sample Location:027G000944 Lab File ID:NAS221.001 Calibration Std.:vc0608.001 Date: 06/08/95 Blank: blk0608.001 Dilution:

tion:

	Concen.	Concen.	Biank
Compound	PID (ppb)	Hail (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BOL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachioroethene	BDL	BOL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	97.6	97.4	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-isopropyitoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	BOL	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	π/ a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

~ 1

ASSEMBLY C CSI REPORT NAVAL SUPPORT ACTIVITY MEMPHIS MILLINGTON, TENNESSEE

RCRA FACILITY INVESTIGATION SWMU 62 — M-21 ARRESTING GEAR



REVISION 2

CTO-094

Contract No: N62467-89-D-0318

Prepared for:

Department of the Navy Southern Division Naval Facilities Engineering Command North Charleston, South Carolina



Prepared by:

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* *	•				

LIST OF ACRONYMS AND ABBREVIATIONS

BRAC Base Realignment and Closure

bls below land surface

CSI Confirmatory Sampling Investigation

DPT direct push technology
DQOs Data Quality Objectives
E/A&H EnSafe/Allen & Hoshall

HI hazard index

ILCR Incremental Lifetime Excess Cancer Risk

IM Interim Measures

MCL maximum contaminant level

 $\mu g/L$ micrograms per liter mg/kg milligrams per kilogram

ND not detected

NET National Environmental Testing, Incorporated

NSA Naval Support Activity (formerly Naval Air Station)

PCBs polychlorinated biphenyls
PRE Preliminary Risk Evaluation
RBC risk-based concentration
RC reference concentration

RCRA Resource Conservation and Recovery Act

RFI RCRA Facility Investigation

RR risk ratio

SOUTHNAVFACENGCOM Southern Division Naval Facilities Engineering Command

SVOC semivolatile organic compound SWMU solid waste management unit SST Subsurface Technologies, Inc.

THQ target hazard quotient

TR target risk

USEPA United States Environmental Protection Agency

USGS U.S. Geological Survey
UST underground storage tank
VOC volatile organic compound

EXECUTIVE SUMMARY

The Assembly C Site Investigation Plans for Naval Support Activity Memphis proposed two phases of investigation for a Confirmatory Sampling Investigation (CSI) at Solid Waste Management Unit (SWMU) 62, the M-21 Arresting Gear. The first phase consisted of a soil and groundwater investigation using Direct Push Technology (DPT) equipment. Based on the results of the first phase, the second phase, consisting of installing and sampling soil borings and monitoring wells, is not required. This report summarizes the activities conducted during the CSI's first phase and the resulting findings and conclusions.

During the first phase of the CSI, 12 subsurface soil samples collected from two intervals at six locations were analyzed for volatile organic compounds (VOCs). No detected concentration of any VOC in subsurface soil exceeded its U.S. Environmental Protection Agency (USEPA) soil screening level. Fluvial deposits groundwater samples collected from four locations were analyzed for VOCs. No VOC in groundwater exceeded its USEPA risk-based concentration (RBC) for tap water or its maximum contaminant level for drinking water.

To finalize the Resource Conservation and Recovery Act closure of the SWMU, three surface soil samples were collected and analyzed for semivolatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls (PCBs), and Appendix IX metals. No SVOCs or PCBs were detected in the soil samples. No detected concentration of any pesticide exceeded its residential RBC. No detected concentration of any metal exceeded both its residential RBC and its background reference concentration (two times the mean background concentration). The surface soil sample results were used to prepare a Preliminary Risk Evaluation (PRE). The PRE indicates the property is suitable for lease for either residential or commercial land use.

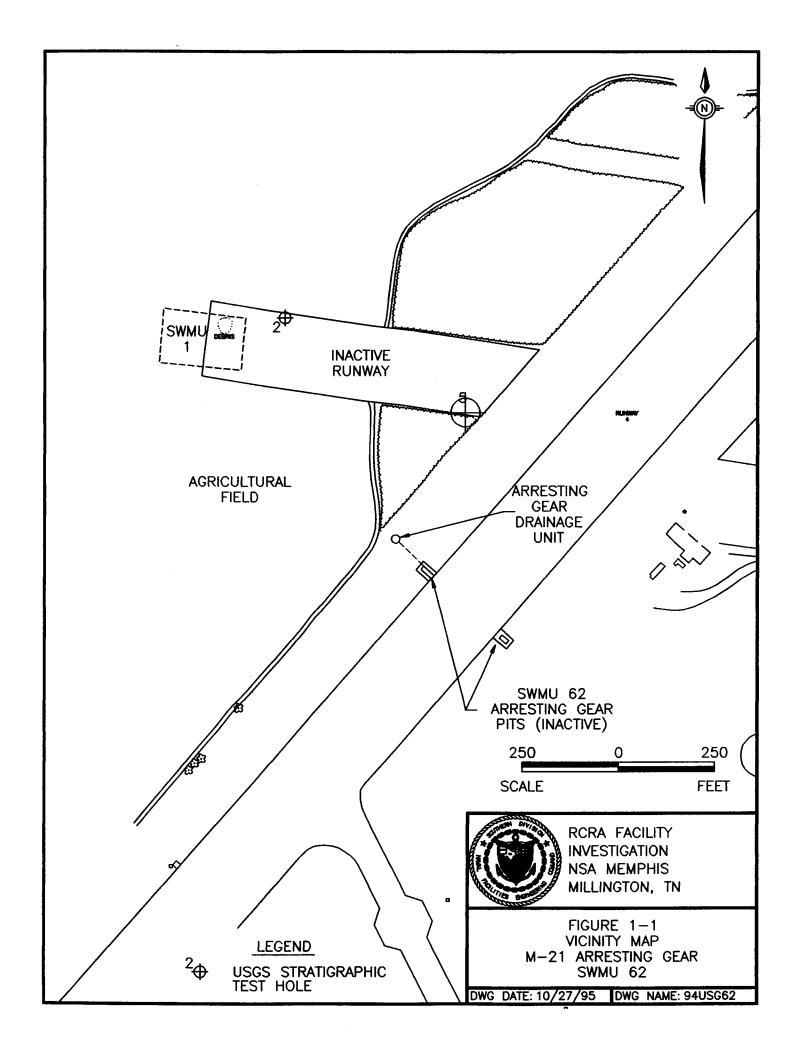
Based on the results of the first phase and the PRE, no further action is recommended for SWMU 62.

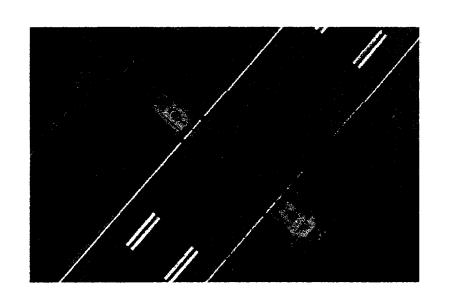
1.0 INTRODUCTION

As part of the U.S. Navy Installation Restoration Program, the following Confirmatory Sampling Investigation (CSI) report has been prepared for Solid Waste Management Unit (SWMU) 62, the M-21 Arresting Gear, on the Northside of Naval Support Activity (NSA) Memphis in Millington, Tennessee. Figures 1-1 and 1-2 provide a vicinity map and aerial photograph of SWMU 62, respectively.

As a result of the Base Closure and Realignment Act of 1990 (BRAC), a portion of NSA Memphis, which includes SWMU 62, will be closed and prepared for transfer to the City of Millington. Eight SWMU assemblies (i.e., groups) have been defined for the NSA Memphis Resource Conservation and Recovery Act (RCRA) Corrective Action Program. Four of these assemblies (A, B, C, and D) are on closing portions of the base and have been categorized and ranked according to their BRAC status. SWMU 62 is in Assembly C, which is composed of five SWMUs requiring CSIs to confirm whether a release of contaminants has occurred and, if so, whether RCRA Facility Investigation (RFI) characterization will be required. The remaining four assemblies (E, F, G, and H) are on portions of the base that will remain open. The investigation, undertaken by EnSafe/Allen & Hoshall (E/A&H), adhered to the requirements of the Hazardous and Solid Waste Amendments portion (HSWA-TN002) of RCRA Permit No. TN2-170-022-600 and applicable regulations.

The Assembly C Site Investigation Plans (E/A&H, 1995) proposed two phases of investigation for the CSI at SWMU 62. The first phase consisted of a subsurface soil and groundwater investigation using Direct Push Technology (DPT) equipment. Based on the results of the first phase, the second phase, consisting of installing and sampling soil borings and monitoring wells, is not required.







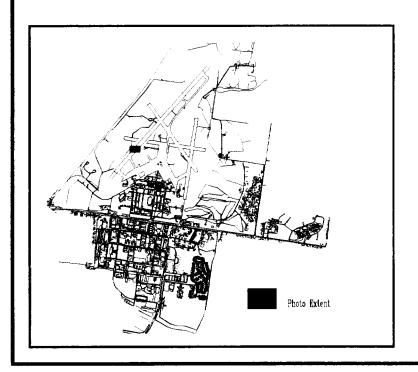




0

200

400 Ft.





RCRA FACILITY INVESTIGATION
NSA MEMPHIS
MILLINGTON, TENNESSEE

FIGURE 1-2 DIGITAL ORTHOPHOTOGRAPH M-21 ARRESTING GEAR SWMU 62

AML bornel/sel/steve/site_di

In addition, three surface-soil samples were collected and analyzed, and the results were used to prepare a Preliminary Risk Evaluation (PRE). The PRE indicates the property is suitable for lease for either residential or commercial land use.

This CSI report summarizes the activities conducted during the first phase of the CSI and provides conclusions, including a recommendation for no further action at SWMU 62.

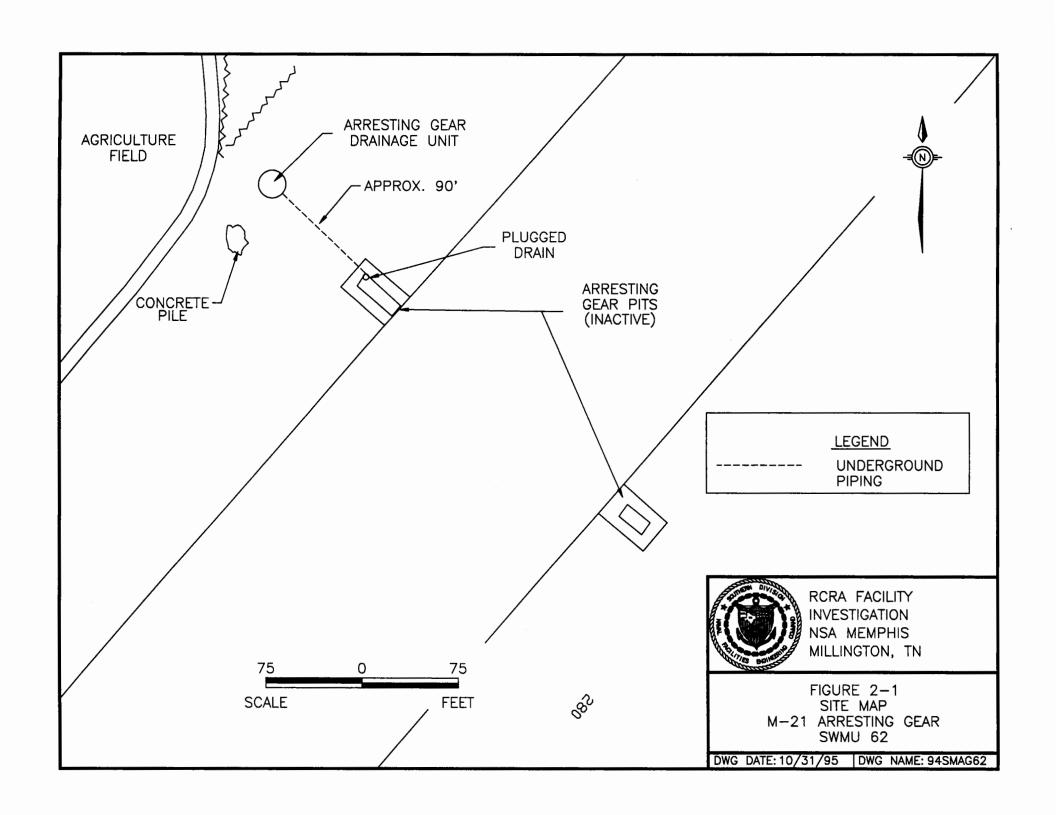
2.0 SITE DESCRIPTION AND HISTORICAL INFORMATION

2.1 Site Description

SWMU 62 is the former location of a portable arresting gear mechanism (M-21) on the active Runway 4-22. The site presently consists of two empty, cement-lined, L-shaped containment pits on either side of the runway that once housed the arresting gear. A 4-foot diameter cement cap, approximately 90 feet west of the western containment pit, covers a makeshift drywell, which once received drainage from the containment pit. This area has been disturbed by past activities and is generally level. The site drains southwest along a drainage swale which ultimately empties into the North Fork Creek. Figure 2-1 provides a site map of SWMU 62.

2.2 Historical Site Operations

The gear, which was powered by a generator, was first used in 1985 for pilot training. A 6-inch diameter polyvinyl chloride drain line was installed in the L-shaped containment pit on the west side of the runway to drain any potentially contaminated rainwater which might otherwise collect in the pit. This drain line led to the drywell. No construction details are available for the well itself, but, according to Public Works personnel, it is constructed of three 55-gallon drums welded end-to-end, buried in a 12-foot deep hole, and seated on a bed of gravel. The bottom drum was perforated to allow water to seep out. The residual contaminants from the arresting gear pit (hydraulic fluid, diesel fuel, and lube oil) would enter the drum unit and float on the heavier water, allowing for periodic removal. A pile of leftover cement is approximately 30 feet west of the drywell.



3.0 PREVIOUS INVESTIGATIONS

No known site investigations were performed before the CSI.

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4.0 FIELD INVESTIGATION AND METHODS

The CSI soil and groundwater sampling program at SWMU 62 was performed to determine if contaminants associated with the arresting gear pits and drywell were present in subsurface soil and groundwater. Specifically, the CSI objectives were:

- Determine the potential for subsurface soil contamination in the loess.
- Determine the potential for groundwater contamination in the loess and fluvial deposits.
- Assess the status/impact from the arresting gear pits and the drywell.
- Determine the suitability of the property for leasing by preparing a PRE.

This section summarizes the soil and groundwater sampling tasks during the first phase of the CSI, which used a hand auger to collect surface soil samples and DPT equipment for subsurface soil and groundwater sampling. The field sampling activities followed the procedures outlined in the U.S. Environmental Protection Agency (USEPA) and Tennessee Department of Environment and Conservation-approved *Comprehensive RFI Work Plan* (E/A&H, 1994) and *Assembly C Site Investigation Plans* (E/A&H, 1995).

Section 4.1 presents the general sampling protocols and rationale for the hand-auger surface-soil investigation and the DPT subsurface soil investigation. Section 4.2 presents the general sampling protocols and rationale for the DPT groundwater investigation. Specific sampling protocols (sample handling, field Quality Assurance/Quality Control [QA/QC], and decontamination) are presented in Section 4.3.

Analytical Parameters

Three surface-soil samples were collected and analyzed to prepare a PRE to determine the suitability of the property for leasing. These samples were shipped to the National Environmental Testing (NET) laboratory in Bedford, Massachusetts, and analyzed for semivolatile organic compounds (SVOCs) by USEPA Method 8270, pesticides/polychlorinated

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biphenyls (PCBs) by USEPA Method 8080, and Appendix IX metals by USEPA Method

6010/7000 series.

Subsurface soil and groundwater samples were collected during the DPT investigation to

determine the nature and extent of possible petroleum or solvent contamination at SWMU 62 by

selecting volatile organic compounds (VOCs) as an indicator parameter. Each sample was

transported to Hydrologic, Inc.'s onsite mobile laboratory for the immediate analysis of VOCs

by USEPA Method 8021. Approximately 25% of the samples were split (duplicates) for QA/QC

purposes during the screening survey. They were shipped to NET for VOC analysis by USEPA

Method 8240.

Soil and groundwater samples submitted to Hydrologic's onsite laboratory were analyzed for

VOCs using Level II-equivalent Data Quality Objectives (DQOs). Soil and groundwater samples

submitted to NET were analyzed using a Level III-equivalent DQO for 95% of the samples and

a Level IV-equivalent DQO for 5% of the samples.

E/A&H validated the results of the surface soil samples. Validata Chemical Services, Inc., of

Norcross, Georgia, validated the analytical results of the NET confirmation samples collected

during the DPT investigation. Attachment 1 contains the validation report, which indicates that

the overall data quality of the analytical work is satisfactory.

Hand-Auger Sampling Methods

On February 13, 1996, E/A&H collected three surface soil samples at SWMU 62 using a

3-inch-diameter, stainless-steel hand auger. The hand auger was advanced from land surface to

1 foot below land surface (bls) using a clockwise motion. The soil collected in the auger was

placed in a stainless-steel bowl for processing.

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DPT Sampling Methods

On May 15, 22, 25, and 26, 1995, E/A&H conducted a DPT survey at SWMU 62 to obtain subsurface soil and groundwater samples for VOC analyses. Subsurface Technologies, Inc. (SST), of Orlando, Florida, provided and operated the DPT equipment, consisting of truck-mounted, hydraulically operated probes which collected subsurface information. The piezocone system, which consists of an electronic cone penetrometer, was used to obtain lithologic information by estimating and plotting point-stress, sleeve friction, and pore pressure as it was advanced from ground surface, through the loess, and into the upper fluvial deposits. The geocone sampler, which is a split-spoon sampler with a push plug on the leading end, was advanced and retracted to retrieve relatively undisturbed subsurface soil samples from specific depths at various locations throughout the SWMU. The hydrocone (a GS-1 groundwater sampler) obtained groundwater samples from specific depths in the upper fluvial deposits, with and without an applied vacuum, and generated hydraulic conductivity information. DPT sampling methods are detailed in Section 4.4.4.3 of the *Comprehensive RFI Work Plan* (E/A&H, 1994).

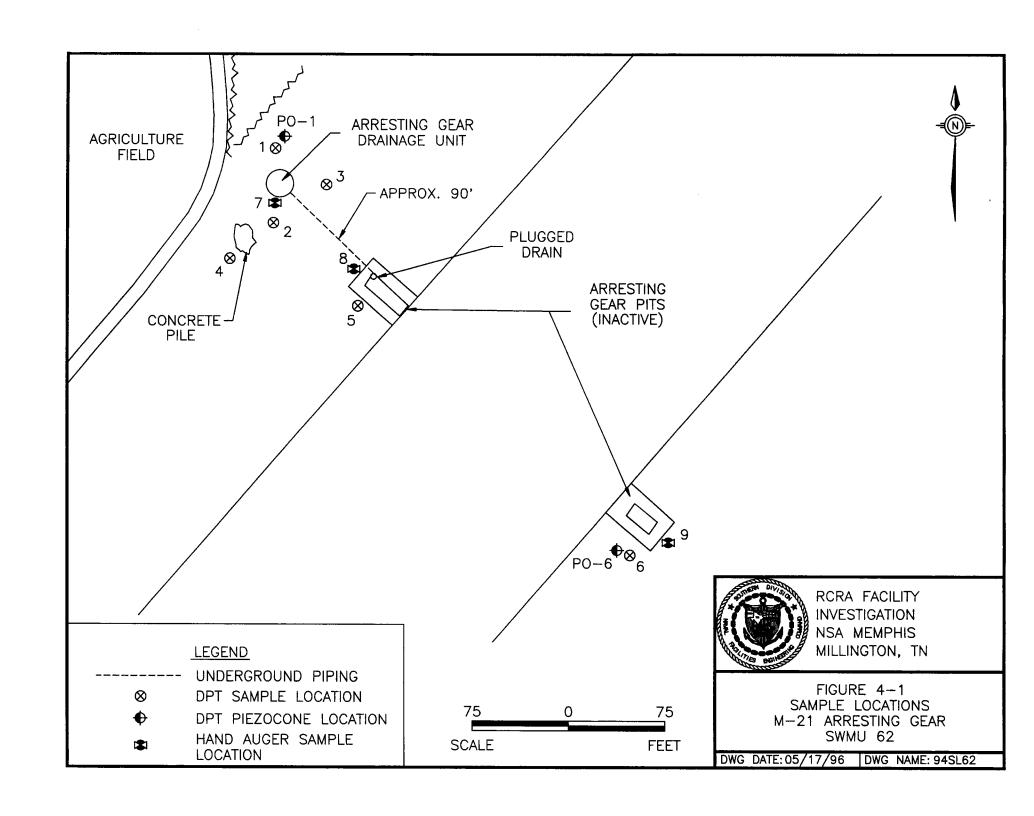
4.1 Subsurface and Surface Soil Investigation

4.1.1 Surface Soil Investigation

The Comprehensive Sampling Investigation Report for Assembly C (E/A&H, Revision 0 — November 1, 1995) stated that three surface soil samples would be collected from 0 to 1 foot bls — one immediately adjacent to each arresting gear pit and one next to the drywell. Figure 4-1 shows the sample locations. Each surface soil sample was collected with a decontaminated stainless-steel hand auger and immediately placed in a stainless-steel bowl in preparation for homogenization and containerization.

Surface Soil Sampling Rationale

The surface soil samples were collected near the three most prominent features of the SWMU: the arresting gear pits and the drywell.



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Surface Soil Sample Collection Methods

An E/A&H representative collected the surface soil samples with a stainless-steel hand auger.

Upon retrieval, the soil was removed from the hand auger and placed in a stainless-steel bowl

for processing. Each sample was homogenized with a clean, stainless-steel spoon in accordance

with Section 4.2.10 of the Region IV USEPA Standard Operating Procedures/Quality Assurance

Manual and containerized as outlined in Section 4.4.4 of the Comprehensive RFI Work Plan

(E/A&H, 1994). After containerization, each sample was immediately placed on ice for

transport to the offsite laboratory. Sample location, designation, and time collected were

recorded in the field logbook.

4.1.2 DPT Subsurface Soil Investigation

The DPT investigation assessed the nature and extent of contamination in subsurface soil at

SWMU 62. Shallow subsurface soil samples (less than 3 feet bls) were collected from the loess

at each of the six DPT locations proposed in the Assembly C Site Investigation Plans

(E/A&H, 1995). No water-bearing zone was present in the loess; therefore, deeper (17 to

20 feet bls) subsurface soil samples were also collected from this unit. Figure 4-1 shows the

DPT sample locations.

Subsurface Soil Sampling Rationale

Before collecting subsurface soil and groundwater samples, SST performed two piezocone

soundings (PO-1 and PO-6) to develop a tentative lithologic profile. PO-1 was advanced to the

west of the runway next to the drywell, and PO-6 was advanced near the eastern arresting gear

pit. Figure 4-1 shows the piezocone locations, and Appendix A contains the piezocone file

information and plots. As shown on the piezocone logs and plots, the water-bearing zone in the

fluvial deposits is readily identifiable at 38 feet bls (PO-1) and 32 feet bls (PO-6). The

piezocone information does not suggest that a water-bearing zone is present in the loess.

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laboratory analysis.

The Assembly C Site Investigation Plans (E/A&H, 1995) proposed the following shallow soil-sampling intervals: 0 to 1 foot bls near the drywell (Locations 1, 2, 3, and 4) and 2 to 3 feet bls near the arresting gear pits (Locations 5 and 6). Due to poor sample recovery and the presence of roots and vegetation around the drywell, the 1- to 3-foot subsurface soil interval was sampled at Locations 1 and 3, and the 2- to 4-foot interval was sampled at Location 2. The 1- to 3-foot interval was sampled at Locations 4, 5, and 6 to obtain enough sample volume for

The Assembly C Site Investigation Plans (E/A&H, 1995) proposed collecting a subsurface soil sample from the soil/water interface in the loess if a groundwater sample could not be collected. The piezocone plots did not identify a water-bearing zone in the loess; moreover, split-spoon soil sampling confirmed the absence of groundwater in this zone. Therefore, as outlined in the work plan, a subsurface soil sample was collected from the loess at each of the six proposed DPT sampling stations from the 18- to 20-foot interval (except for Location 3, where the 17-to 19-foot interval was sampled). The following section provides details regarding the subsurface soil sampling procedures.

Subsurface Soil Sample Collection Methods

An E/A&H geologist logged and processed the subsurface soil samples for field screening and submittal to the analytical laboratory. SST collected the samples with the DPT rig using a 2-foot long, 2-inch outside diameter, split-spoon geocone sampler. Upon retrieval, the sampler was opened, and the soil was immediately screened for organic vapors using an HNu (model GP 101, with a 10.2 eV lamp) photoionization detector. No organic vapors were detected. A representative soil sample was collected and placed in a jar for onsite VOC analysis by Hydrologic. Twenty-five percent of the soil samples were split and shipped to NET for confirmation analysis. A description of each soil sample; the field screening results; and sample location, designation, and time collected were recorded in the field logbook.

4.2 DPT Groundwater Investigation

The DPT groundwater investigation focused on the water-bearing zone in the fluvial deposits, which is a preferential zone of groundwater flow and a potential route for contaminant transport. As previously mentioned, the loess at SWMU 62 did not have a water-bearing zone capable of providing groundwater samples. The water-bearing zones at NSA Memphis are described in Section 5, Geology and Hydrogeology.

Groundwater Sampling Rationale

As described in Section 4.1.1, two DPT piezocones were advanced at SWMU 62 to determine the depth of potential water-bearing zones in the loess and fluvial deposits. Based on the piezocone results, no water-bearing zone was identified in the loess, and depth to groundwater in the fluvial deposits ranged from 35 to 40 feet bls. To confirm the absence of a water-bearing zone in the loess, SST advanced the hydrocone to 18 feet bls at Location 1. After 15 minutes, a vacuum was applied to the sampler in an attempt to draw water into the collection device. The sampler was raised 1 foot every 15 minutes in an attempt to find a water-bearing zone, but no groundwater entered the sampler. This procedure was abandoned at 9 feet bls, and subsurface soil samples were collected as outlined in Section 4.1.1.

Groundwater Sample Collection Methods

Groundwater samples were collected during the DPT investigation using the hydrocone. The SST technician advanced the hydrocone to refusal (between 37 and 42 feet bls) at each DPT location to obtain a groundwater sample from the fluvial deposits. The volume of groundwater entering the hydrocone was monitored on the on-board computer screen. When at least 100 milliliters of groundwater had entered the sampler, the hydrocone was retracted. Groundwater samples were collected directly from the sampler by inserting a new piece of Teflon tubing into the bottom port of the hydrocone and decanting the groundwater directly into the sample vials to minimize the loss of VOCs. If no groundwater entered the hydrocone after 30 minutes, a vacuum was applied to the sampling device. After an additional waiting period

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(typically 20 minutes), if no water had entered the sampler, it was raised in 1-foot increments

every 15 minutes for 1.5 hours in an attempt to find a water-bearing zone.

E/A&H collected a fluvial deposits groundwater sample from Locations 1, 4, 5, and 6 at depths

ranging from 38 to 42 feet bls. No fluvial deposits groundwater sample could be collected from

Locations 2 and 3; sampler refusal was at 37 and 38 feet, respectively, which apparently was

not deep enough to penetrate the water-bearing zone in the fluvial deposits at these locations.

4.3 Sampling Protocol

The CSI sampling activities adhered to the approved Comprehensive RFI Work Plan and the

Assembly C Site Investigation Plans. Sample handling was minimized. When transferring

material from the sampling device to containers, the operation was conducted expediently, in as

clean an environment as possible. A new pair of disposable gloves was donned before collecting

each subsurface soil and groundwater sample. Empty containers were kept packaged until used,

at which time they were immediately chilled and isolated in coolers. Subsurface soil samples

for VOC analysis were containerized immediately upon collection to minimize the loss of VOCs.

Surface soil samples for SVOC, pesticide/PCB, and Appendix IX metals were thoroughly

homogenized prior to containerization. Groundwater samples were obtained directly from the

hydrocone.

4.3.1 QA/QC Samples

During the DPT investigation, QA/QC samples were collected to test the level of reproducibility

attainable in the sampling and analytical processes. QA/QC samples were analyzed for VOCs,

as were the associated environmental samples. Soil and groundwater duplicate samples,

collected at a frequency of 25% during the DPT investigation, were submitted to the offsite

laboratory (NET) for confirmation analysis. Duplicate sample analytical results are discussed

in Section 6, Nature and Extent of Contamination.

4.3.2 Sample Processing and Chain-of-Custody Procedure

Sample containers requiring chemical preservation (i.e., hydrochloric acid for aqueous samples) were preserved by the testing laboratory and shipped to E/A&H in sealed packages. Sample containers were labeled with the sample identification number, date, sampler's name, and requested analytical parameter, then placed in a cooler immediately following collection. Each sample was logged in the sample logbook. Samples for onsite laboratory analysis were transported by the E/A&H geologist directly to the onsite lab. The Hydrologic chemist recorded each sample in a sample logbook immediately upon receipt.

Samples submitted to NET were prepared for shipment by wrapping each container in bubble wrap, placing it in a resealable plastic bag, and packing it on ice inside a sturdy cooler. Cooler lids were secured with packing tape and sealed with signed custody seals. Packaged samples were then shipped overnight via FedEx priority service for next morning delivery. The offsite laboratory was notified the day of shipment of the number of samples submitted. NET reported all sample shipments arrived in good condition and at the appropriate temperature.

To ensure the integrity of the sample transfer process, a strict chain-of-custody procedure was implemented. This procedure was initiated in the field for each sampling event and conducted through custody transfer to the analytical laboratory. A chain-of-custody form was completed for each batch of samples, itemizing sample numbers, containerization, preservatives, analyses requested, date and time of sampling, and FedEx shipping number. Custody transfers were recorded by signature, date, and time of relinquishment, and receipt of custody by the parties involved.

4.3.3 Sample Labeling

All samples collected in the field were labeled with an alphanumeric code that identifies the site, sample type, and sample location. The first three digits identify the site location, and the fourth digit identifies the sample matrix (S = soil, G = groundwater). The last six digits identify the

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sample location and interval. For example, the sample label "062G006038" designates a

SWMU 62 groundwater sample collected from Location 6 at a depth of 38 feet. Note: An

exception to the labeling scheme occurred at Location 1. The first two digits identify the SWMU,

the second two digits identify the matrix (SG denotes a soil sample collected with the geocone,

GH denotes a groundwater sample collected with the hydrocone), and the last four digits identify

the sampling station and maximum depth of sample collection. For instance "62SG0120"

designates a SWMU 62 soil sample collected with the geocone sampler at Location 1 at a

maximum depth of 20 feet.

4.4 Grouting Procedures

SST filled each DPT boring with neat cement grout following sample collection.

4.5 Decontamination Procedures

SST's downhole field equipment was decontaminated in accordance with guidelines set forth in

the Assembly C Site Investigation Plans (E/A&H, 1995). All downhole and sampling equipment

was decontaminated before and after each use at either the central decontamination pad set up

at the N-7 aircraft wash rack, at the decontamination pad east of SWMU 40 across First Avenue,

or at the Southside decontamination pad. Rinse water generated from decontamination activities,

stored in a 1,200-gallon holding tank at the central decontamination pad, was discharged to the

sanitary sewer system after a VOC scan and approval from the City of Millington's wastewater

consultant, Fisher & Arnold, Inc.

Decontamination procedures for downhole equipment consisted of the following steps:

High-pressure wash with a hot soap and water mixture

Rinse with potable water

Rinse with deionized organic-free water

• Rinse twice with pesticide-grade isopropyl alcohol

- Rinse with deionized organic-free water
- Wrap with aluminum foil or plastic

A new pair of disposable nitrile gloves was donned before handling decontaminated sampling equipment. Subsurface soil samples were collected directly from the split-spoon sampler, groundwater samples directly from the hydrocone, and surface soil samples directly from the hand auger; therefore, no investigation-derived waste was generated from these sampling activities.

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5.0 GEOLOGY AND HYDROGEOLOGY

5.1 Regional Geology and Hydrogeology

The general hydrogeology of the Memphis area is discussed in detail in Section 2.11 and a conceptual model of the hydrogeology at the NSA is presented in Section 2.12 of the Comprehensive RFI Work Plan (E/A&H, 1994). Updated information is available in the Hydrogeology of Post-Wilcox Group Stratigraphic Units in the Area of the Naval Air Station Memphis, Near Millington, Tennessee (Kingsbury and Carmichael, 1995), provided in Attachment 2 of this document. On the basis of this updated information, the hydrogeology of NSA Memphis is re-summarized below.

The two stratigraphic units investigated during the RFIs at NSA Memphis are the loess/alluvial deposits of Pleistocene and Holocene age and the underlying fluvial deposits of Pleistocene to Pliocene age. The loess — eolian deposits consisting of silt, silty clay, clay, and minor amounts of sand — is the principal unit occurring at land surface throughout the NSA Memphis Northside. Alluvium, which is restricted to stream valleys, includes alluviated or reworked loess. The loess is typically 0 to 65 feet thick in the Memphis area; at NSA Memphis it ranges from 15 to 45 feet thick. Water-bearing zones are present in the loess primarily in the upper part of this unit; however, yields are low and water quality analyses performed during the water use survey portion of previous underground storage tank investigations indicate that loess groundwater does not meet many primary and secondary drinking water standards. Previous investigations at NSA Memphis have found depth to water in the loess varying between 5 and 15 feet bls and vertical hydraulic conductivities to range from 10-6 to 10-8 centimeter per second. Although the loess may be considered an aquitard on the basis of the relatively low hydraulic conductivities, this shallowest water-bearing zone is present within this interval. Groundwater flow in the loess is primarily downward, although locally some groundwater in the loess may discharge to nearby streams, drainage ditches, and other surface water bodies.

The fluvial deposits underlie the loess in upland areas and consist of sand, gravel, and some clay, with thin layers of ferruginous sandstone and conglomerate at the base. This unit ranges

from 0 to 100 feet thick in the Memphis area; on the Northside of NSA Memphis it ranges from

10 to 60 feet thick and represents the most significant component of the surficial aquifer. Many

shallow domestic wells in the Memphis rural areas are completed in the fluvial deposits.

Relative groundwater elevations between wells completed in the loess/alluvium and fluvial

deposits indicate semiconfined to confined conditions in the fluvial deposits. Typically a

downward vertical gradient exists between water in the loess and the fluvial deposits. Sediments

in the fluvial deposits generally coarsen with depth, and typically, the upper portion consists of

a mixture of very fine sand with varying degrees of silt and clay and becomes increasingly less

silty with depth, grading into a fine to medium sand near the middle of the unit. Grain sizes

typically coarsen below this interval, grading into a gravelly sand near the fluvial deposits basal

section.

The fluvial deposits are underlain by the Cockfield Formation, a part of the Jackson-upper

Claiborne confining unit, which is a heterogeneous formation consisting of very fine silty sand

interbedded with clay and silt lenses or clay with interbedded fine sand lenses. The Cockfield

Formation ranges in thickness from approximately 35 to 180 feet in the NSA Memphis area.

The more-permeable characteristics of the fluvial deposits, compared to the relatively

impermeable properties of the overlying loess/alluvium and the underlying Jackson-upper

Claiborne confining unit, result in the fluvial deposits being the preferential zone of groundwater

flow and the route for contaminant transport in NSA Memphis's subsurface.

5.2 Site-Specific Geology and Hydrogeology

The following sections provide site-specific geologic and hydrogeologic information obtained

from stratigraphic test borings, previous investigations, and the SWMU 62 DPT investigation.

5.2.1 USGS Stratigraphic Test Boring

The United States Geological Survey (USGS) drilled stratigraphic test hole 2 approximately 700 feet northwest of SWMU 62 in April 1994 (see Figure 1-1). Attachment 2 of this document contains a copy of the previously referenced Kingsbury and Carmichael publication, which provides a geologic cross-section showing test hole 2 (USGS designation Sh:U-98. This boring was drilled 22 feet into the top of the Cook Mountain Formation to better understand the site geology prior to monitoring well installations at NSA Memphis. Cuttings from the test hole were visually logged by a field geologist during drilling, and the test hole was geophysically logged following completion. The stratigraphy and lithologies encountered are as follows:

Loess: Approximately 45 feet of wind-blown silt deposits (loess).

These materials were described as silt and clay.

Fluvial Deposits: Approximately 51 feet of fluvial deposits. These materials

were described as sand and gravel.

Cockfield Formation: Approximately 82 feet of alternating sand, clay, and some

lignite.

Cook Mountain Formation: The Cook Mountain Formation was characterized as a

dense, light olive-gray to greenish-gray clay. It serves as the confining unit separating the Cockfield Formation from the Memphis aquifer. The termination depth of the boring was 200 feet bls, with the top of the Cook Mountain

Formation encountered at approximately 178 feet bls.

The USGS collected a Shelby-tube sample from stratigraphic test hole 2 for geotechnical analysis. The vertical permeability of a subsurface soil sample from the 199- to 200-foot interval (Cook Mountain Formation) was 4.5 x 10-5 cm/sec.

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5.2.2 Previous Investigations

Site-specific subsurface soil information was collected while implementing the

Interim Measures (IM) investigation at SWMU 1, the Fire Department Drill Area, which is

approximately 500 feet northwest of SWMU 62 (see Figure 1-1). According to the

IM Investigation Report SOUTHNAVFACENGCOM, USGS, E/A&H, March 1993), visual

classification indicated low-permeability silts with varying degrees of clay extending to at least

44 feet bls. No permeability data for subsurface soil were collected at SWMU 1.

Based on the topography, the information in the conceptual model of the NSA Memphis

hydrogeology (Section 2.12 of the Comprehensive RFI Work Plan), recent data collected during

Assembly A SWMU RFIs, and communication with USGS representatives, groundwater in the

fluvial deposits flows locally toward the north-northwest. Groundwater flow in the loess is

primarily downward, although locally some groundwater in the loess may discharge to nearby

streams, drainage ditches, and other surface water bodies.

5.2.3 DPT Piezocone Soundings

As outlined in Section 4.1.1 of this document, two piezocone soundings (designated PO-1 and

PO-6; refer to Figure 4-1) were performed at SWMU 62 to obtain information about the

lithology and potential water-bearing zones before collecting samples. Appendix A provides

piezocone logs and plots for SWMU 62. E/A&H used this information to select groundwater

sampling intervals for the DPT investigation. As shown on the piezocone logs, the potential

water-bearing zones in the fluvial deposits are below 38 feet at PO-1 and below 32 feet at PO-6.

These zones are described on the lithologic log as a cemented sand, silty fine sand, and fine sand

and are readily identifiable on the associated plots by the higher point stress. Based on the

piezocone logs and plots, no definitive water-bearing zone is present in the loess.

5.2.4 DPT Hydrocone Plots

During the DPT investigations, the hydrocone obtained groundwater samples from specific depths in the fluvial deposits. The sampling device, which included a transducer attached to an on-board computer system via an umbilical cable, recorded the fill rate, hydrostatic pressure, and gas pressure. The computer estimated horizontal permeability by applying the time and rate-of-filling data to the standard Bouwer and Rice rate-of-rise permeability models. However, due to an instrument malfunction, only one horizontal permeability measurement was obtained during the SWMU 62 investigation. The horizontal hydraulic permeability of the fluvial deposits at Location 4 (Figure 4-1) was 4.59 x 10-5 cm/sec at a depth of 42 feet. Appendix A provides the hydrocone sample plot and horizontal permeability measurement for the groundwater sample collected from Location 4.

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6.0 NATURE AND EXTENT OF CONTAMINATION

This section presents the results of the surface soil (0 to 1 foot bls), subsurface soil (> 1 foot bls), and groundwater samples collected during the CSI. Surface soil samples were analyzed for SVOCs, pesticides/PCBs, and Appendix IX metals. Subsurface soil and groundwater samples were analyzed for VOCs.

Detected concentrations of organics and inorganics have been compared with media-specific guidance concentrations from the USEPA Region III Risk-Based Concentration (RBC) Table (July to December 1995) to evaluate the risk associated with exposure to soil and groundwater contaminants and to assess the transfer potential of contaminants from soil to groundwater. In addition, metals concentrations for the soil samples are compared with established reference concentrations (RCs) derived from background samples at NSA Memphis to determine if they represent naturally occurring concentrations. Background RC calculations were provided in the Technical Memorandum — Assemblies A through D Background Reference Concentrations, E/A&H, September 18, 1996).

Specifically, surface soil sample results are compared with RCs, residential and industrial RBCs, and soil screening levels (SSLs); whereas subsurface soil sample results are compared with RCs and SSLs only (USEPA Region III RBC Table, July to December 1995). Groundwater sample results are compared with RBCs for tap water (USEPA Region III RBC Table, July to December 1995) and the USEPA maximum contaminant level (MCL) for drinking water (USEPA Drinking Water Regulations and Health Advisories, May 1995).

Section 6.1 briefly discusses the criteria used to determine the RCs (two times the mean background concentration) for metals. Section 6.2 summarizes the detected contaminants in soil compared with the respective RBC and/or SSL values. Contaminants identified in surface soil are further evaluated in the Preliminary Risk Evaluation (Section 7). Section 6.3 summarizes the detected constituents in groundwater compared with their RBC and MCL values. Contaminants detected at SWMU 62 are summarized in Section 6.4.

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6.1 Background Reference Concentrations

Background locations were established at five areas at NSA Memphis (shown on Figure 6-1) to

determine ambient soil and groundwater quality conditions. Background data for soil samples

only are discussed here as no SWMU 62 groundwater samples were analyzed for metals.

Background data for soil consist of 12 samples collected from five boring locations. The

background RCs for metals were calculated by doubling the mean concentration detected. Two

RCs were established for soil — one for surface soil (0 to 1 foot bls) and one for subsurface soil

(> 1 foot bls). Table 6-1 shows the RCs for metals detected in surface soil.

6.2 Soil Sample Analytical Results

The following sections summarize the results of soil samples collected during the CSI.

Appendix B contains the analytical data.

6.2.1 Surface Soil Samples

E/A&H collected three surface soil samples from 0 to 1 foot bls. The samples were analyzed

for pesticides/PCBs, SVOCs, and Appendix IX metals. Figure 4-1 shows the surface soil

sampling locations, and Table 6-1 summarizes the detected contaminant concentrations.

Pesticides/PCBs

Two pesticides, 4,4'-DDT and dieldrin, were detected in one surface soil sample. The

4,4'-DDT concentration did not exceed its residential RBC or SSL. Although the dieldrin

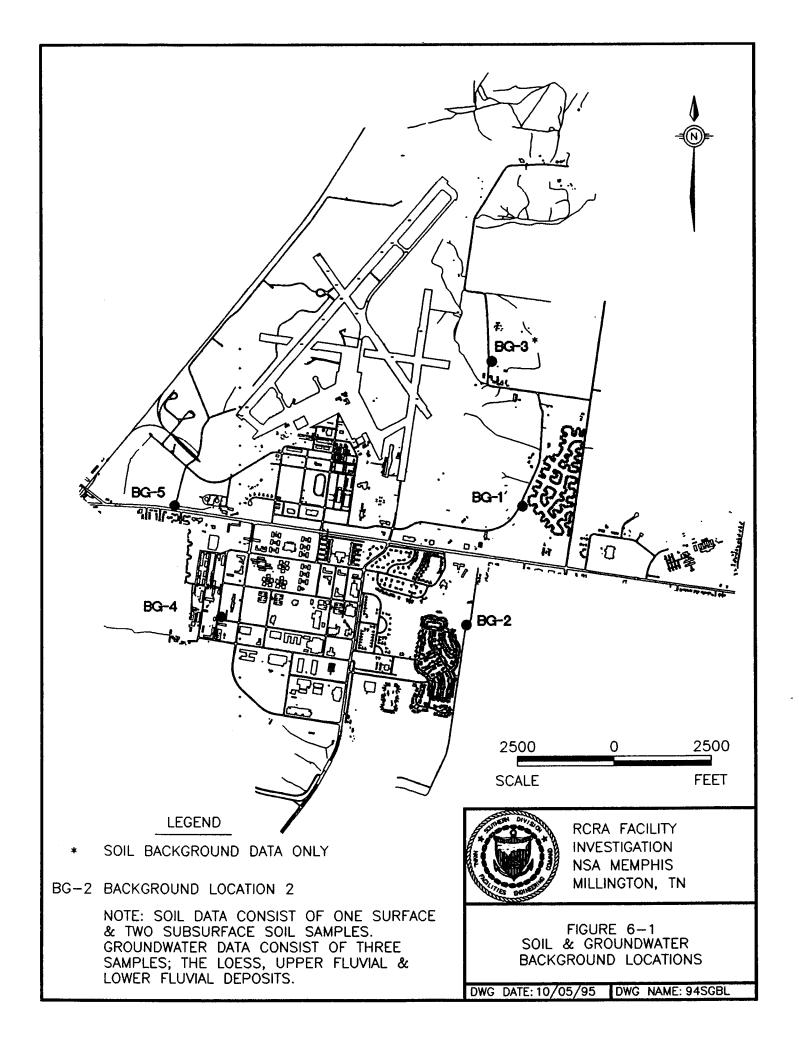
concentration of 0.011 milligrams per kilogram (mg/kg) in surface soil sample 062S000801

exceeded the transfer from soil to groundwater SSL (0.001 mg/kg), it did not exceed the average

background concentration (0.131 mg/kg) stated in the June 2, 1995, Technical Memorandum

Discussion of Dieldrin Risk Management Issues (E/A&H, 1995) or its residential RBC

(0.04 mg/kg). As stated in the memorandum, dieldrin is ubiquitous at NSA Memphis as a result



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Table 6-1

Detected Concentrations of Metals, Pesticides, and SVOCs in Surface Soil

SWMU 62 — M-21 Arresting Gear

(data in milligrams per kilogram)

Sample Location/ID

Analyte	7 (0 - 1') 062S000701	8 (0 - 1') 062S000801	9 (0 - 1') 062S000901	RC• 0 - 1'	SSL	RBC ^c Residential	RBC ^c Industrial				
Metals											
Arsenic 10.5 10.4 9.7 13.2 15 0.43 3.8											
Barium	150	113	113	191	32	5,500	140,000				
Cadmium	4	3.9	2.9	ND⁴	6	39	1,000				
Chromium	8.32 Je	12	8.9	26.4	19	390	10,000				
Cobalt	10,5 J	9.7 J	8,6 J	20.6		4,700	120,000				
Copper	18.9	18.9	18	27	-	3,100	82,000				
Lead	11.7	14.1	11.1	28.7	Nones	Nones	None≠				
Nickel	19.4	16.4	16.3	ND	21	1,600	41,000				
Silver	3 J	ND	ND	ND		390	10,000				
Vanadium	24.1	25.4	20	49.6		550	14,000				
Zinc	59	54	49.7	88.3	42,000	23,000	610,000				
Tin	20.3 J	22.5 J	12 J	ND		47,000	1,000,000				

Table 6-1 Detected Concentrations of Metals, Pesticides, and SVOCs in Surface Soil SWMU 62 — M-21 Arresting Gear (data in milligrams per kilogram)

Sample Location/ID

Analyte	7 (0 - 1') 062S000701	8 (0 - 1') 062S000801	9 (0 - 1') 062S000901	RC• 0 - 1'	SSL	RBC ^c Residential	RBC ^c Industrial				
	Organic Compounds										
4,4'-DD T ND 0.003 ND — 1 1.9 17											
Dieldrin	ND	0.011	ND	0.131h	0.001	0.04	0.36				

Notes:

- RC = Reference concentration (2 x the mean background concentration). Background concentrations were established for the 0 to 1-foot and the greater than 1-foot intervals below land surface using analytical data from 12 soil samples collected from five background soil boring locations at various locations on the Northside and Southside of NSA Memphis (Technical Memorandum Assemblies A through D Background Reference Concentrations, E/A&H, September 18, 1996).
- b SSL = Soil Screening Level; obtained from the USEPA Region III RBC Table, July to December 1995.
- c RBC = Risk-based concentration; obtained from the USEPA Region III RBC Table, July to December 1995.
- ^d ND = Analyte was not detected.
- e J = Estimated concentration.
- r No guidance concentration exists for this analyte.
- Although there is no published SSL or RBC for lead, USEPA has published a recommended soil screening concentration of 400 mg/kg for residential land use and 1,000 mg/kg for industrial land use (Office of Solid Waste and Emergency Response Directive 9355.4-12).
 - = The June 2, 1995 Technical Memorandum Discussion of Dieldrin Risk Management Issues (E/A&H, 1995) states that the average concentration of dieldrin in samples collected during a background study at NSA Memphis was 0.131 mg/kg. Though background concentrations are normally assumed to be zero for organic compounds, this value has been included for comparison.

Bold indicates analyte exceeds the RC.

Italics indicates analyte exceeds the soil screening level.

LARGE PRINT indicates analyte exceeds the residential RBC.

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of aerial applications during a U.S. Department of Agriculture quarantine on the white-fringed beetle during the 1950s and 1960s. Risk estimates based on the soil dieldrin concentrations at NSA Memphis did not exceed 1E-4 Incremental Lifetime Excess Cancer Risk (ILCR). The average concentration of samples collected during a background study was 0.131 mg/kg with a maximum detected concentration of 0.311 mg/kg. As stated in the memorandum, "This finding indicates that dieldrin levels found at each SWMU do not necessitate remedial action in the absence of other significant carcinogenic risk contributors." In addition, because of the chemical properties of dieldrin and the physical properties of soil, it is not expected to leach in appreciable quantities (if at all) into underlying groundwater.

SVOCs

No SVOCs were detected in the surface soil samples collected from SWMU 62.

Appendix IX Metals

Twelve Appendix IX metals were detected in the surface soil samples (refer to Table 6-1). The residential and industrial RBCs for arsenic (0.43 mg/kg and 3.8 mg/kg, respectively) were exceeded in all three surface soil samples; however the detected arsenic concentrations (9.7 mg/kg to 10.5 mg/kg) did not exceed the RC (13.2 mg/kg) or the SSL (15 mg/kg). The barium concentration in all three samples (ranging from 113 mg/kg to 150 mg/kg) exceeded the SSL (32 mg/kg) but not the RC (191 mg/kg) or the residential RBC (5,500 mg/kg). Cadmium, nickel, silver, and tin concentrations exceeded their RCs but not their SSLs or RBCs.

6.2.2 Subsurface Soil Samples

E/A&H collected 12 subsurface soil samples. Two intervals were sampled at each of the six DPT sampling locations as outlined in Section 4.1. The samples were analyzed for VOCs. Figure 4-1 shows the subsurface soil sampling locations, and Table 6-2 summarizes the detected contaminant concentrations.

Table 6-2 Detected Concentrations of VOCs in Subsurface Soil SWMU 62 — M-21 Arresting Gear (data in milligrams per kilogram)

Sample Location/ID

	2 (18 - 20')	5 (18' - 20')	6 (18' - 20')	
Analyte	062S000220	062S000520	062S000620	SSL
n-Propylbenzene		ND*	ND	
Methylene chloride	ND	0.002 J ^d	0.001 J	0.010

Notes:

- SSL = Soil Screening Level; obtained from the USEPA Region III RBC Table, July to December 1995.
- b ND = Compound not detected.
- c No reference or guidance concentration exists for this analyte.
- J = Estimated concentration.

No VOCs were detected in soil samples at concentrations exceeding SSLs. The only VOCs detected in the subsurface soil samples were n-propylbenzene in the 18-to 20 foot interval sample at Location 2 (0.0053 mg/kg; no SSL exists), methylene chloride in the 18 to 20-foot interval sample from Location 5 (0.002 mg/kg; SSL = 0.010 mg/kg), and methylene chloride in the 18 to 20-foot sample from Location 6 (0.001 mg/kg). n-Propylbenzene is a common petroleum constituent, and methylene chloride is a common laboratory artifact.

6.3 Groundwater Samples

E/A&H collected groundwater samples from the fluvial deposits at Locations 1, 4, 5, and 6. The groundwater samples were analyzed for VOCs. Figure 4-1 shows the sampling locations, and Table 6-3 summarizes the detected VOCs concentrations.

Table 6-3
Detected Concentrations of VOCs in Groundwater
SWMU 62 — M-21 Arresting Gear
(data in micrograms per liter)
Sample Location/ID

Analyte	5 (40' to 41') 062G005041	RBC ² Tap Water	MCL ^b Drinking Water
	Q Te	3,700	
Methylene chloride	1 J	4.1	5
Toluene	1.7	750	1,000

Notes:

- * RBC = Risk-Based Concentration; obtained from the USEPA Region III RBC Table, July to December 1995.
- b MCL = Maximum Contaminant Level for Drinking Water; obtained from the USEPA Drinking Water Regulations and Health Advisories, May 1995.
- c J = Estimated concentration
- ^d = No guidance concentration exists for this analyte.

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The only VOCs detected in fluvial deposits groundwater were in the confirmation samples analyzed by the offsite laboratory. The detected VOCs were toluene, acetone, and methylene chloride. No detected VOC exceeded its respective RBC for tap water or MCL for drinking water. Toluene was detected in one sample at 1 microgram per liter (μ g/L) (RBC = 750 μ g/L, MCL = 1,000 μ g/L). Acetone was detected in one sample at 9 μ g/L (RBC = 3,700 μ g/L, no MCL exists). Methylene chloride was detected in one sample at 1 μ g/L (RBC = 4.1 μ g/L and MCL = 5 μ g/L). Acetone and methylene chloride are common laboratory artifacts. Figure 4-1 shows the DPT groundwater sampling locations.

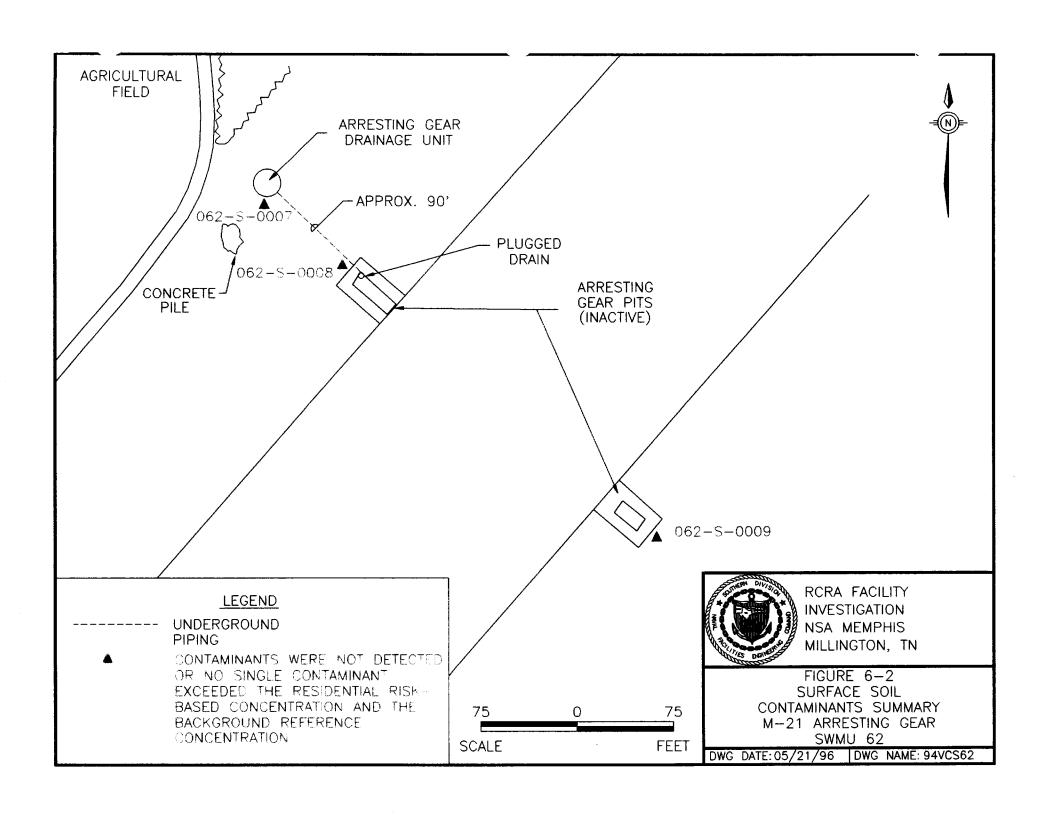
6.4 Summary of Nature and Extent

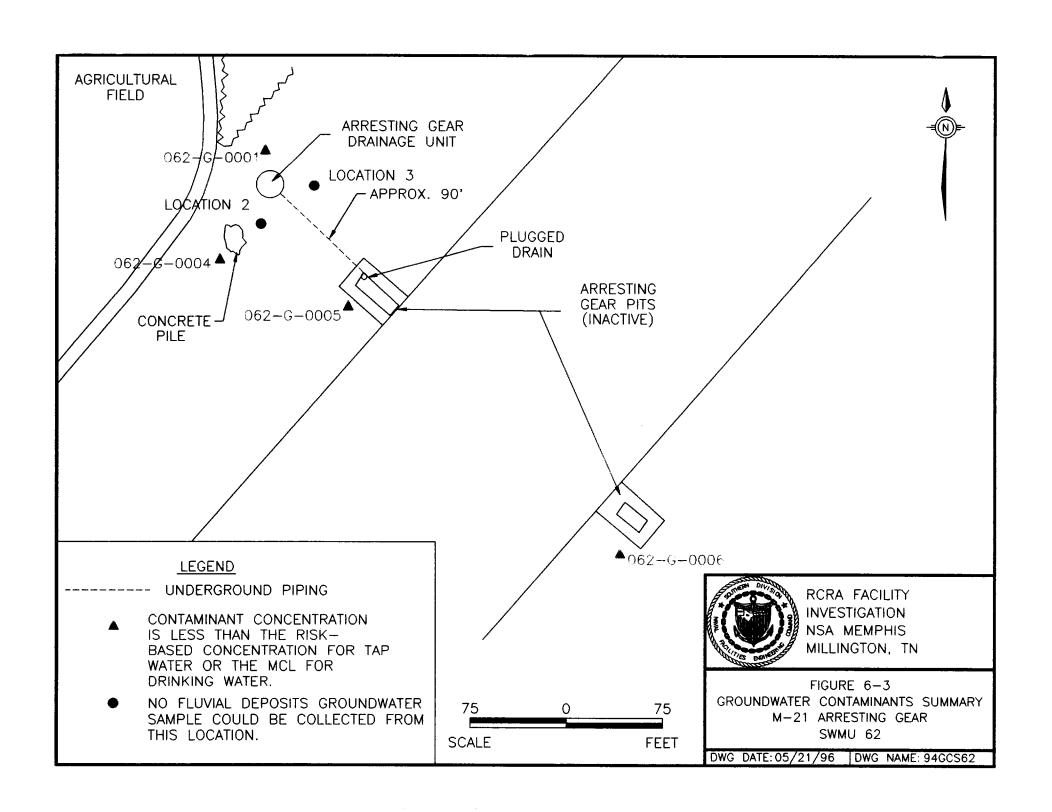
Soil and groundwater analytical results indicate minimal contamination at SWMU 62. No SVOCs were detected in surface soil samples. No detected concentration of any pesticide in surface soil exceeded its residential RBC, and no metals in surface soil exceeded both the residential RBC and RC. No detected concentration of any VOC in subsurface soil exceeded its SSL. No groundwater contaminant exceeded its RBC for tap water or its MCL for drinking water. Figures 6-2 and 6-3 summarize surface soil and groundwater contaminants, respectively.

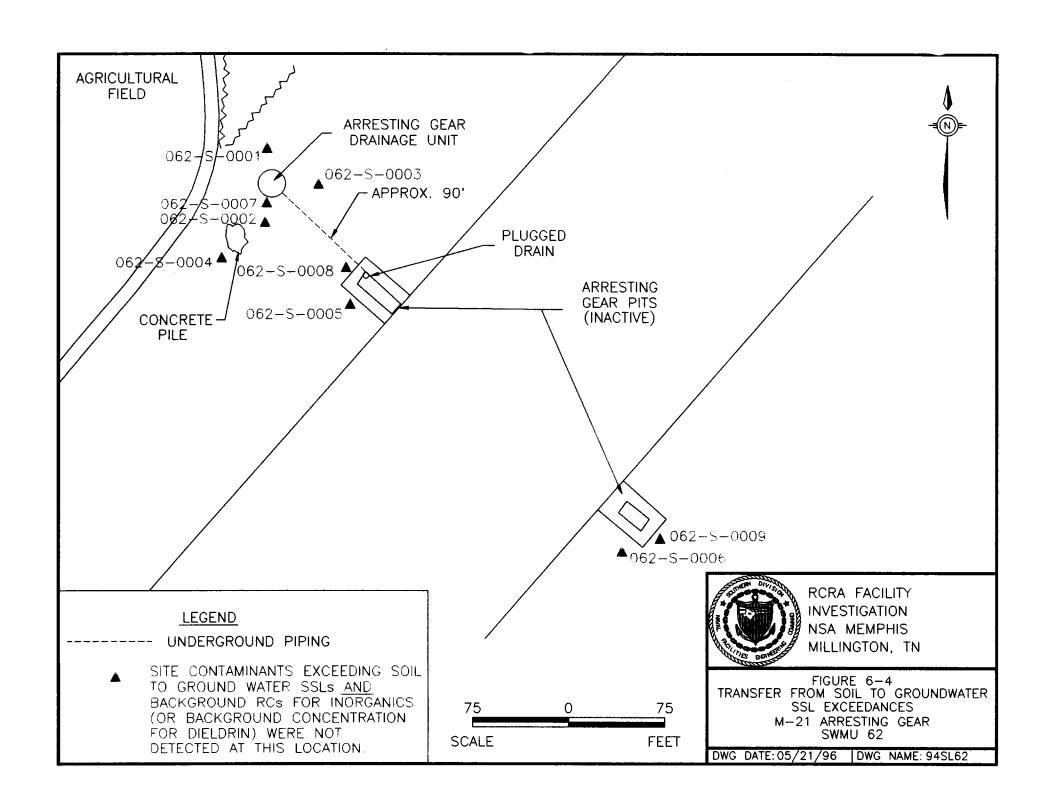
Contaminant Transfer from Soil to Groundwater

Tables 6-1 and 6-2 provide SSL values for transfer from surface and subsurface soil to groundwater. Figure 6-4 illustrates that no contaminant in any soil sample exceeded both the RC (or background concentration for dieldrin) and the SSL.

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7.0 PRELIMINARY RISK EVALUATION

In accordance with Guidance on *Preliminary Risk Evaluations for the Purpose of Reaching a Finding of Suitability to Lease* (USEPA Region IV Memorandum, November 1994), a PRE was conducted for SWMU 62 to finalize the RCRA closure of the SWMU. Three surface soil samples were collected from unpaved areas — one next to each arresting gear pit and one next to the drywell (refer to Figure 4-1). The samples were shipped to an offsite laboratory (NET of Bedford, Massachusetts) under chain-of-custody documentation for the following analyses:

Analysis Method

SVOCs USEPA Method 8270

Chlorinated Pesticides/PCBs USEPA Method 8080

40 CFR 264 Appendix IX Metals USEPA Method 6010/7000 Series

A PRE is conducted by constructing a table for carcinogenic and systemic (noncarcinogenic) compounds. The maximum concentration for each detected chemical and its corresponding RBC concentration were entered into the table to calculate cumulative human health risk. Soil data used in the calculations are exclusively from samples collected across the surface soil interval (0 to 1 foot bls).

Proportionate risk is calculated for each detected site chemical by comparing its maximum reported concentration with the corresponding RBC value. Risk and hazard for residential and commercial scenarios were calculated separately. RBC values were calculated by USEPA based on a risk threshold of 10-6 for carcinogens or a hazard quotient threshold of 1.0 for noncarcinogens. Therefore, a risk ratio is calculated for each contaminant by one of the following two equations:

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Carcinogenic Risk Ratio: $RR = \underline{media\ concentration} \times TR$

screening value

Noncarcinogenic Risk Ratio: $RR = media \ concentration \times THQ$

screening value

where:

RR = the risk ratio

Media Concentration = the maximum concentration of a site chemical Screening Value = the RBC value for that particular chemical

TR = target risk used by USEPA to calculate RBCs for

carcinogens (10-6)

THQ = target hazard quotient used by USEPA to calculate RBCs

for noncarcinogens (1.0)

Tables 7-1 and 7-2 summarize PRE results for SWMU 62 for carcinogens and noncarcinogens, respectively. The risk ratios for each chemical are summed separately for both residential and commercial scenarios to determine the overall site risk. For each scenario, cumulative risk (for carcinogens) and cumulative hazard index (HI) (for noncarcinogens) are calculated separately, and the cumulative risk and HI are each compared to the corresponding cumulative threshold in accordance with the November 1994 USEPA Region IV Memorandum.

If the carcinogenic ILCR is greater than 10⁻⁴ (the cumulative risk threshold) or the noncarcinogenic HI is greater than 1 (the cumulative HI threshold), the site may require additional investigation for the corresponding land use scenario (USEPA Region IV Memorandum, November 1994). If neither threshold is exceeded, the property is considered suitable to lease for the specified land use scenario.

TABLE 7-1
PRELIMINARY RISK EVALUATION FOR SWMU 62
RESIDENTIAL AND COMMERCIAL CARCINOGENS
NSA MEMPHIS RFI

	Reference		Residential RBC		Commercial RBC	
	Concentration	Maximum	Carcinogen	Risk	Carcinogen	Risk
Parameter	(mg/kg)	(mg/kg)	(mg/kg)	Ratio	(mg/kg)	Ratio
' Arsenic	13.1	10.5	0.43		3.8	
Barium	19.1	150				
Cadmium	ND	4				
Chromium	26.4	12				
Cobalt	15	10.5				
Copper	23.6	18.9				
4,4'-DDT		0.003	1.9	1.6E-09	17	1.76E-10
Dieldrin		0.011	0.04	2.8E-07	0.36	3.06E-08
Lead	28.7	14.1				
Nickel	ND	19.4				
Silver	ND	3				
Tin		22.5				
Vanadium	49.6	25.4				
Zinc	88.3	59				
		ILCR	SUM	3E-07	SUM	3E-08

NOTES:

ILCR Incremental excess lifetime cancer risk
HI Hazard index

Blank spaces Indicates not applicable

ND Not detected

- All concentrations are in parts per million (mg/kg).
 - The maximum concentration reported for each contaminant was used to develop the table above.
 - Soil sample data were from the surface (0-1') interval only.
- Screening values (RBCs) are from the July to December 1995
 Risk-Based Concentration (RBC) Table (October 20, 1995 USEPA
 Region III RBC memo).
- The maximum lead (Pb) concentration reported at SWMU 62 was
 14.1 mg/kg. This is less than the 400 mg/kg residential soil
 screening level for total lead (USEPA OSWER Directive 9355.4-12).
- Metal was excluded from the risk ratio because the maximum reported concentration is less than the corresponding reference concentration.

TABLE 7-2
PRELIMINARY RISK EVALUATION FOR SWMU 62
RESIDENTIAL AND COMMERCIAL NONCARCINOGENS
NSA MEMPHIS RFI

		Reference Concentration	Maximum	Residential RBC Noncarcinogen	Hazard	Commercial RBC Noncarcinogen	Hazard
	Parameter	(mg/kg)	(mg/kg)	(mg/kg)	Ratio	(mg/kg)	Ratio
							•
*	Arsenic	13.1	10.5				
	Barium	19.1	150	5500	0.027	140000	0.0011
	Cadmium	ND	4	39	0.10	1000	0.004
*	Chromium	26.4	12	390		10000	
*	Cobalt	15	10.5	4700		120000	
*	Copper	23.6	18.9	2900		76000	
	4,4'-DDT		0.003				
	Dieldrin		0.011				
	Lead	28.7	14.1				
	Nickel	ND	19.4	1600	0.012	41000	0.00047
	Silver	ND	3	390	0.0077	10000	0.0003
	Tin		22.5	1000000	0.00002	47000	0.00048
*	Vanadium	49.6	25.4	550		14000	
*	Zinc	88.3	59	23000		610000	
			н	SUM	0.14968	SUM	0.00632

NOTES:

ILCR Incremental excess lifetime cancer risk

HI Hazard index

Blank spaces Indicates not applicable

ND Not detected

- All concentrations are in parts per million (mg/kg).
- The maximum concentration reported for each contaminant was used to develop the table above.
- Soil sample data were from the surface (0-1') interval only.
- Screening values (RBCs) are from the July to December 1995
 Risk-Based Concentration (RBC) Table (October 20, 1995 USEPA
 Region III RBC memo).
- The maximum lead (Pb) concentration reported at SWMU 62 was
 14.1 mg/kg. This is less than the 400 mg/kg residential soil
 screening level for total lead (USEPA OSWER Directive 9355.4-12).
- Metal was excluded from the risk ratio because the maximum reported concentration is less than the corresponding reference concentration.

This PRE does not evaluate the potential exposure that might be experienced by construction workers should site structures be excavated in the future. This would require an acute or subchronic assessment of subsurface soil data. For the site worker scenario, USEPA recommends an exposure duration of 25 years — a chronic exposure scenario. Exposure durations less than seven years, as would be assumed for a construction worker scenario, are considered acute or subchronic. RBCs would be less conservative if calculated based on a subchronic or an acute exposure scenario. USEPA used chronic-based toxicological information when calculating RBCs, or USEPA made conservative adjustments to reflect chronic exposure. In addition to the effect the exposure duration differences would have on a construction worker's cumulative risk and hazard estimates, toxicological information used by USEPA to calculate RBCs would be adjusted to reflect acute or subchronic toxicological endpoints rather than the chronic endpoints typically used. Acute and subchronic thresholds are based on lower exposure durations than chronic thresholds, and higher concentrations are generally necessary to elicit observable toxic effects. Higher thresholds for toxic effects result in less conservative toxicological information, which would be used to adjust RBCs for either acute or subchronic exposure. Because a construction worker would be exposed under either acute or subchronic conditions, and RBCs based on chronic exposure are generally more conservative, the commercial site worker scenario presented in this PRE would be a more conservative scenario than that for a construction worker. Subsurface soil concentrations would have to be significantly higher relative to those reported in surface soil to pose risk equivalent to that estimated for surface soil.

The Preferred Reuse Alternative in the *Base Reuse and Development Plan* (RKG Associates Inc., 1995), indicates the most likely reuse of the parcel of land containing SWMU 62 will be for airfield operations. Due to the nature of this proposed use, a commercial setting can be assumed to evaluate risk. With respect to the commercial scenario, the resulting ILCR and HI were well below the established criteria of 10⁻⁴ and 1, respectively. In addition, the resulting

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ILCR and HI for the residential scenario were below the established 104 ILCR threshold and

the HI threshold of 1.

Conclusions and Recommendations

Based on the information gathered during this investigation, the following conclusions and

recommendations have been reached:

• SWMU 62 will likely be used for airfield operations.

• Fourteen pesticides and inorganics were detected in the three surface soil samples.

• The maximum reported concentration of arsenic exceeded residential and commercial

RBCs; however, the detected concentration does not exceed the reference (background)

concentrations as shown on Tables 7-1 and 7-2.

• Based on a PRE performed on data from the samples collected from 0 to 1 foot bls:

— Carcinogens — Neither the commercial nor residential ILCRs exceeded the 104

threshold, indicating suitability for lease with no further action for both

commercial and residential land use.

— Noncarcinogens — Neither the commercial nor residential HIs exceeded 1,

indicating suitability for lease with no further action for both commercial and

residential land use.

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8.0 CONCLUSIONS AND RECOMMENDATIONS

Three surface soil samples collected near the arresting gear pits and drywell were analyzed for

SVOCs, pesticides/PCBs, and Appendix IX metals, and the results were used to prepare a PRE.

Twelve subsurface soil samples and four fluvial deposits groundwater samples were collected

near the arresting gear pits and the drywell associated with SWMU 62 and analyzed for VOCs.

Based on the information gathered during this investigation, the following conclusions and

recommendations have been reached:

• No SVOCs were detected in surface soil samples.

No detected concentration of any pesticide exceeded its residential RBC.

No detected concentration of any metal in surface soil exceeded both its residential RBC

and its SSL.

No detected concentration of any VOC in subsurface soil exceeded its SSL.

• No groundwater contaminant exceeded its RBC for tap water or its MCL for drinking

water.

The PRE concluded that the property is suitable for lease for either residential or

commercial land use.

Based on the results of the investigation and the PRE at SWMU 62, no further action is

recommended for this site.

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9.0 REFERENCES

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Appendix A

DPT Piezocone and Hydrocone Plots

PIEZOCONE SOUNDING LOG Page: 1

SOUNDING #: 62-P01 CLIENT: ENSAFE DATE: 05-15-1995

JOB NAME OR #: NASM094 LOCATION: SWMU62 ST1 DEPTH OF GROUNDWATER: 18 FE

Depth	PP	PΤ	SL	FR	Soil Type	N	VES	FA	RD	YM	USS	SEN	CM	OCR
======	======	=======	======	======		=====	======	======	======	======	======		======	322==
4.00	-0.14	92.69	0.59	0.63	Silty Fine Sand	23	0.05	>45	100+	204			556	
5.00	-0.17	92.43	1.12	1.22	Silty Fine Sand	23	0.10	>45	98	203			555	
6.00	0.09	47.55	0.73	1.53	Silty to Clayey F.S.	16	0.15	>45	73	105			285	
7.00	-0.25	41.28	0.16	0.38	Silty Fine Sand	10	0.20	44	65	91			248	
8.00	-0.03	56.71	0.40	0.70	Silty Fine Sand	14	0.24	45	71	125			340	
9.00	0.01	45.89	0.63	1.37	Silty to Clayey F.S.	15	0.29	43	62	101			275	
10.00	-0.03	46.12	0.78	1.69	Silty to Clayey F.S.	15	0.34	42	60	101			277	
11.00	-0.02	47.96	0.51	1.06	Silty to Clayey F.S.	16	0.39	42	59	106			288	
12.00	-0.02	50.85	0.78	1.53	Silty to Clayey F.S.	17	0.44	41	59	112			305	
13.00	-0.03	54.38	0.77	1.41	Silty to Clayey F.S.	18	0.49	41	60	120			326	
14.00	0.01	31.77	0.71	2.22	Clayey Fine Sand	13	0.54			416	2.1	2.7	64	>10
15.00	-0.00	34.33	0.70	2.03	Clayey Fine Sand	14	0.59			450	2.2	3.0	69	>10
16.00	-0.03	29.02	0.21	0.72	Silty to Clayey F.S.	10	0.63	36	38	64			174	
17.00	-0.02	38.06	0.18	0.48	Silty to Clayey F.S.	13	0.68	37	45	84			228	
18.00	-0.05	34.31	0.26	0.76	Silty to Clayey F.S.	11	0.73	36	41	75			206	
19.00	0.06	33.63	0.32	0.96	Silty to Clayey F.S.	11	0.76	36	40	74			202	
20.00	-0.05	40.67	0.78	1.91	Clayey Fine Sand	16	0.79			532	2.7	3.1	81	>10
ຳ1.00	0.21	12.49	0.54	4.34	Clay	12	0.82			156	0.8	1.4	62	4
2.00	0.29	11.95	0.11	0.91	Clayey Fine Sand	5	0.85			148	0.7	6.6	60	3
23.00	0.28	15.75	0.20	1.27	Clayey Fine Sand	6	0.88			198	1.0	4.7	79	5
24.00	0.31	9.34	0.15	1.61	Sandy Clay	5	0.91			112	0.6	3.7	47	2
25.00	0.32	17.29	0.14	0.79	Clayey Fine Sand	7	0.94			218	1.1	7.6	86	5
26.00	0.37	14.50	0.38	2.64	Sandy Clay	7	0.97			180	0.9	2.3	73	4
27.00	0.34	20.55	0.65	3.15	Sandy Clay	10	0.99			261	1.3	1.9	41	7
28.00	0.37	24.77	0.47	1.89	Clayey Fine Sand	10	1.02			317	1.6	3.2	50	
32.00	0.39	40.09	0 .55	1.37	Silty to Clayey F.S.	13	1.15	34	39	88			241	
33.00	0.46	34.29	0.18	0.53	Silty to Clayey F.S.	11	1.18	33	34	75			206	
34.00	0.40	43.70	0.26	0.60	Silty to Clayey F.S.	15	1.21	35	41	96			262	
35.00	0.41	41.90	0.23	0.54	Silty to Clayey F.S.	14	1.24	34	39	92			251	
36.00	0.67	35.22	0.38	1.09	Silty to Clayey F.S.	12	1.27	33	34	77			211	
37.00	0.72	30.42	0.52	1.71	Clayey Fine Sand	12	1.30			388	1.9	3 .5	61	11
38.00	0.74	31.21	0.75	2.40	Clayey Fine Sand	12	1.33			398	2.0	2.5	62	
40.00	-0.16	241.74	0.37	0.15	Cemented Sand to HardPan	40	1.40	43	87	532			1450	

PP - Pore Pressure (Kg/cm2)

PT - Point Bearing (Kg/cm2)

SL - Sleeve Friction (Kg/cm2)

FR - Friction Ratio (%)

GWD - Ground Water Depth

N - Equivalent SPT Blow Count (bpf)

VES - Vertical Effective Stress (Kg/cm2)

FA - Friction Angle (Degress)

RD - Relative Density (+ or - 5%)

YM - Youngs Modulus

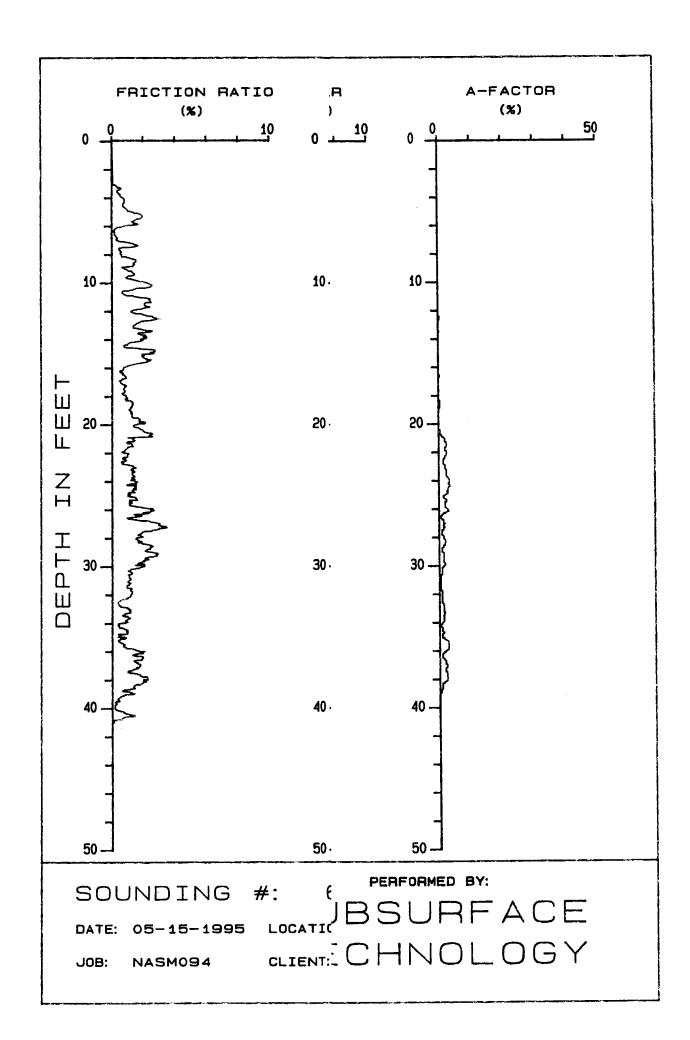
USS - Undrained Sheer Strength

SEN - Sensitivity

CM - Constrained Modulus

OCR - Estimated Over Consolidation Ratio

The above data was computed utilizing SST's in-house correlations and guidelines published in 'Guidelines for Use and iterpretation of the Electronic Cone Penetration Test', Robertson and Campanella, September, 1989.



SOUNDING #: 62-P06	CLIENT: ENSAFE	1	DATE: 05-22-19	995	
JOB NAME OR #: NASMO94	LOCATION: SWMU62 ST6	DEPTH OF	GROUNDWATER:	18	FE
**********	*************************	*******	******	****	

Depth	PP	PT	SL	FR	Soil Type	N	VES	Fλ	RD	YM	USS	SEN	СМ	OCR
2.00	-0.09	27.85	0.49	1.76	Clayey Fine Sand	11	0.05			371	1.9	3.4	56	>10
3.00	0.05	24.71	0.02	0.06	Silty to Clayey F.S.	8	0.10	>45	60	54			148	
4.00	0.03	29.16	0.56	1.92	Clayey Fine Sand	12	0.15			387	1.9	3.1	58	>10
5.00	0.01	32.16	0.56	1.75	Clayey Fine Sand	13	0.20			426	2.1	3.4	64	>10
6.00	0.11	25.15	0.54	2.15	Clayey Fine Sand	10	0.24			332	1.7	2.8	50	>10
7.00	0.13	27.31	0.38	1.38	Clayey Fine Sand	11	0.29			360	1.8	4.3	55	>10
8.00	0.15	27.57	0.35	1.25	Clayey Fine Sand	11	0.34			363	1.8	4.8	55	>10
9.00	0.23	16.81	0.28	1.64	Clayey Fine Sand	7	0.39			219	1.1	3.7	84	>10
10.00	0.24	19.53	0.31	1.57	Clayey Fine Sand	8	0.44			255	1.3	3.8	98	>10
11.00	0.32	16.34	0.16	0.97	Clayey Fine Sand	7	0.49			211	1.1	6.2	82	>10
12.00	0.38	18.92	0.12	0.65	Clayey Fine Sand	8	0.54			245	1.2	9.2	95	>10
13.00	0.44	14.19	0.06	0.40	Clayey Fine Sand	6	0.59			181	0.9	15.1	71	
15.00	0.51	12.42	-0.07	0.57	Clayey Fine Sand	5	0.68			156	0.8	10.5	62	5
16.00	0.59	16.38	0.07	0.40	Clayey Fine Sand	7	0.73			209	1.0	14.9	82	9
17.00	0.61	17.92	0.17	0.92	Clayey Fine Sand	7	0.78			228	1.1	6.5	90	10
18.00	0.66	17.81	0.14	0.78	Clayey Fine Sand	7	0.83			226	1.1	7 .7	89	8
19.00	0.73	22.79	0.07	0.30	Silty to Clayey F.S.	8	0.86	33	27	50			137	
വ.00	0.76	22.54	0.33	1.48	Clayey Fine Sand	9	0.89			289	1.4	4.0	45	
.3.00	1.06	45.24	0.41	0.91	Silty to Clayey F.S.	15	0.98	36	44	100			271	
24.00	0.29	102.62	2.40	2.34	Silty to Clayey F.S.	34	1.01	41	68	226			616	
25.00	0.73	55.07	1.31	2.38	Clayey Fine Sand	22	1.05			720	3.6	2.5	110	>10
26.00	0.87	35.22	1.12	3.19	Sandy Clay	18	1.07			455	2.3	1.9	70	>10
27.00	0.95	37.41	0.39	1.06	Silty to Clayey F.S.	12	1.10	34	37	82			224	
28.00	1.01	32.37	0.29	0.91	Silty to Clayey F.S.	11	1.13	33	33	71			194	
29.00	1.14	43.49	0.23	0.52	Silty Fine Sand	11	1.17	35	41	96			261	
30.00	0.78	30.00	0.26	0.85	Silty to Clayey F.S.	10	1.20	32	30	66			180	
31.00	0.93	30.56	0.10	0.33	Silty to Clayey F.S.	10	1.23	32	30	67			183	
32.00	-0.29	272.69	1.15	0.42	Cemented Sand to HardPan	45	1.26	44	92	600			1636	
33.00	0.17	126.25	1.29	1.02	Silty Fine Sand	32	1.29	40	70	278			757	
34.00	0.05	191.25	0.71	0.37	Fine Sand	38	1.33	42	82	421			1147	
35.00	-0.18	397.05	2.42	0.61	Cemented Sand to HardPan	66	1.36	>45	100+	874			2382	
			_ /		Dana to natural	50	1,50	. 13	1001	V/1				

PP - Pore Pressure (Kg/cm2)

N - Equivalent SPT Blow Count (bpf)

USS - Undrained Sheer Strength

PT - Point Bearing (Kg/cm2)

VES - Vertical Effective Stress (Kg/cm2)

SEN - Sensitivity

SL - Sleeve Friction (Kg/cm2)

FA - Friction Angle (Degress)

CM - Constrained Modulus

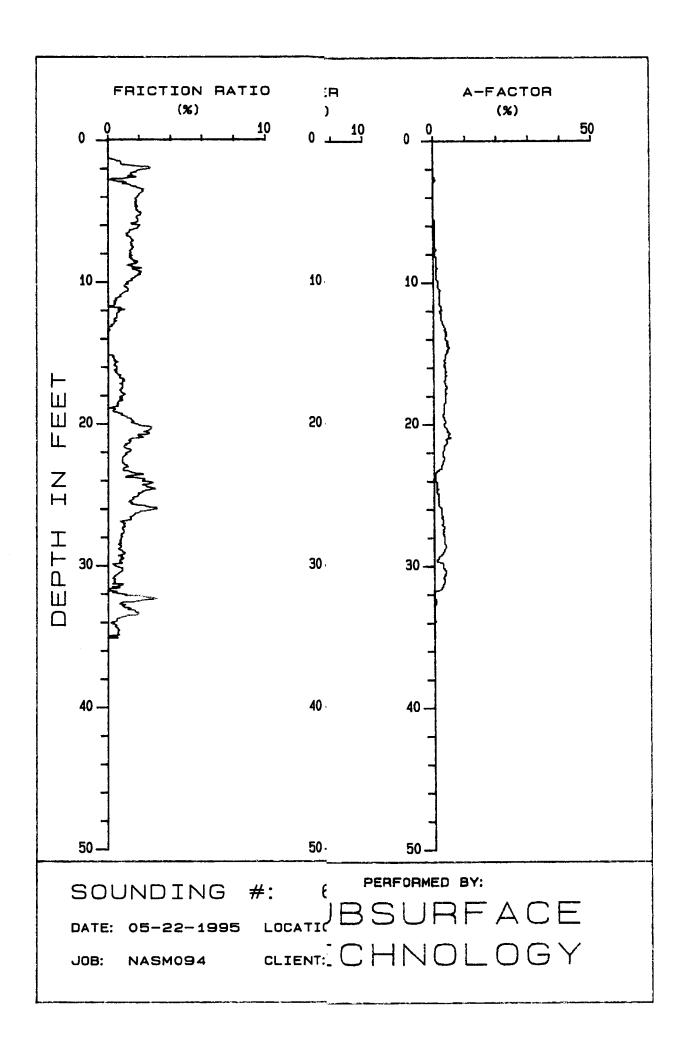
FR - Friction Ratio (%)

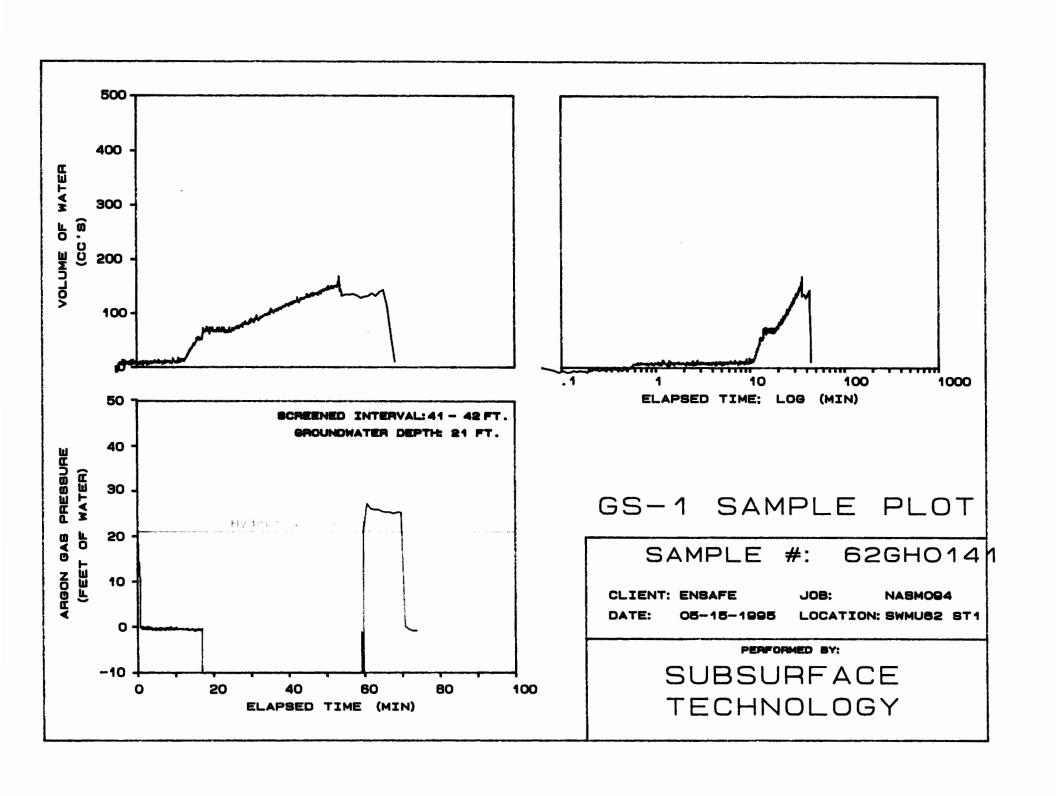
RD - Relative Density (+ or - 5%)

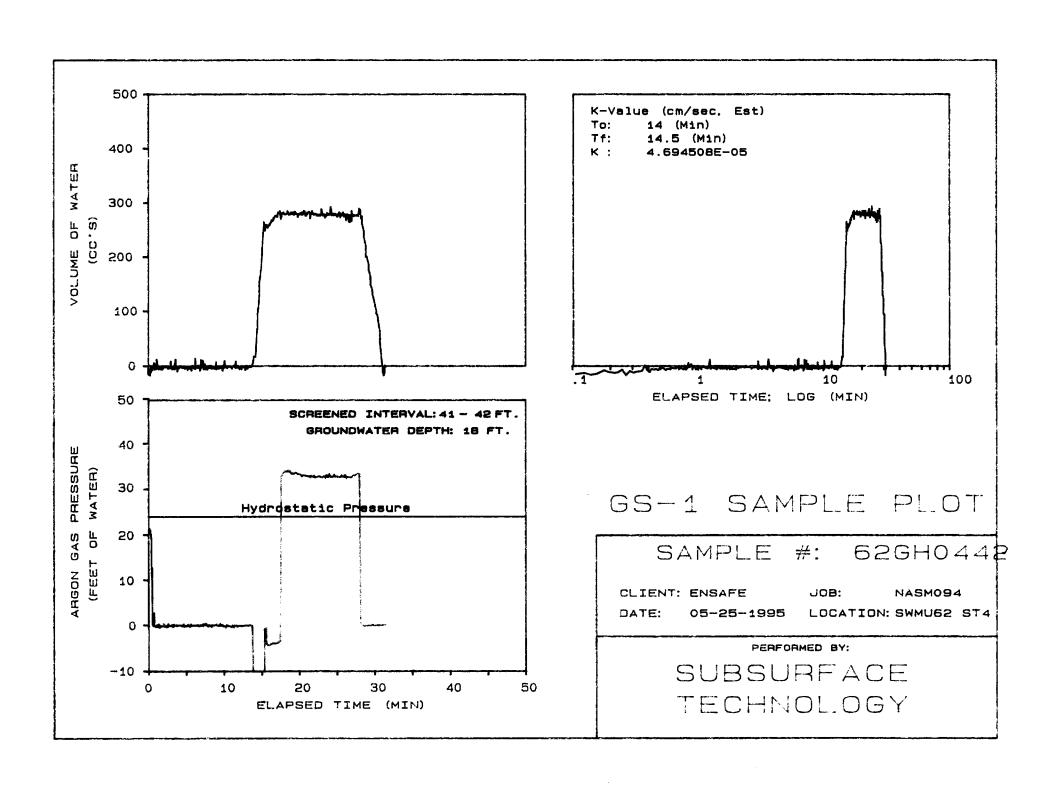
OCR - Estimated Over Consolidation Ratio

GWD - Ground Water Depth YM - Youngs Modulus

The above data was computed utilizing SST's in-house correlations and guidelines published in 'Guidelines for Use and Interpretation of the Electronic Cone Penetration Test', Robertson and Campanella, September, 1989.







Appendix B

Analytical Data

FORMAT: XXXX \ 1 2 3 4 5 6 7 8 9 0

XXXX \ OPTIONAL project prefix

· SITE where sample collected 1 2 3

· MATRIX / QC code

5 6 7 8 · SAMPLING LOCATION 90 - DEPTH, INTERVAL, SERIAL #

All spaces MUST be filled and no extra characters included. Use zeroes as space-fillers. Indicate MS/MSDs on COCs.

MATRIX/QC CODES:

- S soil (surface, borings, and trenches)
- C soil duplicate sample
- M sediment (settled, fluid-borne solid)
- N sediment duplicate
- G groundwater
- H groundwater duplicate sample
- W surface water
- R surface water duplicate sample
- U sludge
- Y sludge duplicate
- A air
- Z liquid waste (including IDW drums)
- V solid waste (including IDW drums)
- T trip blank
- E equipment rinsate blank
- D DI system blank
- P potable water blank
- F field blank
- L filter blank
- B EPA blind spike sample
- 2 cement blank
- ... 3 · drilling mud
 - 4 grout blank
 - 5 bentonite blank
 - 6 sand blank

NSA MEMPHIS NAS MEMPHIS, RFI, ASSEMBLY C

Page:

Time: 13:00

APX9-METAL		SAMPLE ID> ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> MATRIX> UNITS>	062-s-0007-01 062s000701 142608s 062s000701 Soil MG/KG		062-s-0008-01 062s000801 142609s 062s000801 Soil MG/KG		062-S-0009-01 062S000901 142610S 062S000901 Soil MG/KG			
SB AS BA BE CD CR CO CU PB HG NI SE AG TL V ZN	Parameter Antimony Arsenic Barium Beryllium Cadmium Chromium Cobalt Copper Lead Mercury Nickel Selenium Silver Thallium Vanadium Zinc		7.3 10.5 150. 0.98 4. 8.3 10.5 18.9 11.7 0.12 19.4 0.49 3. 0.73 24.1 59. 20.3	VAL UJ U U J U J U J	7.2 10.4 113. 0.96 3.9 12. 9.7 18.9 14.1 0.12 16.4 0.48 0.72 0.72 25.4 54. 22.5	n . n .	7.3 9.7 113. 0.97 2.9 8.9 8.6 18. 11.1 0.12 16.3 0.49 0.73 20. 49.7 12.	Π		

NSA MEMPHIS NAS MEMPHIS, RFI, ASSEMBLY C SWMU 62 - SURFACE SOIL SAMPLES

Page: 2 Time: 13:00

SW846-PEST SAMPLE ID ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> DATE EXTRACTED> MATRIX> UNITS>	062S000701 142608 062S000701 02/13/96 02/15/96 02/20/96 Soil	062-S-0008-01 062S000801 142609 062S000801 02/13/96 02/15/96 02/20/96 Soil UG/KG	062-S-0009-01 062S000901 142610 062S000901 02/13/96 02/15/96 02/20/96 Soil UG/KG	
CAS # Parameter	1695 VAL	1695 VAL	1695 VAL	
309-00-2 58-89-9 319-84-6 319-85-7 319-86-8 57-74-9 72-54-8 72-55-9 50-29-3 60-57-1 959-98-8 33213-65-9 1031-07-8 72-20-8 7421-93-4 76-44-8 1024-57-3 72-43-5 8001-35-2 11141-16-5 11096-82-5 53494-70-5 5103-74-2 1114-16-5 12789-03-6 Aldrin gamma-BHC (Lindane) alpha-BHC beta-BHC delta-BHC beta-BHC delta-BHC beta-BHC delta-BHC hellor delta-BHC beta-BHC delta-BHC beta-BHC delta-BHC hellor delta-BHC beta-BHC delta-BHC hellor alpha-BHC beta-BHC beta-BHC delta-BHC hellor alpha-BHC beta-BHC hellorane alpha-Obler for alpha-BHC beta-BHC hellorane alpha-Obler for alpha-BHC beta-BHC hellorane alpha-Obler for alpha-Chlordane for al	2. U 2. U 2. U 2. U 41. U 4.1 U 41. NR NR NR NR NR NR NR	2. U 2. U 2. U 2. U 40. U 4. U 4	2. U 2. U 2. U 2. U 2. U 41. U 4.1 U 41. U 41. U 41. U 41. U 41. U 41. NR NR NR NR NR NR NR	

NSA MEMPHIS NAS MEMPHIS, RFI, ASSEMBLY C SWMU 62 - SURFACE SOIL SAMPLES

Page: 3 Time: 13:00

SW846-SVOA SAMPLE ID> ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> DATE EXTRACTED> MATRIX> UNITS>	062S000701 142608 062S000701 02/16/96 02/20/96 Soil	062-s-0008-01 062s000801 142609 062s000801 02/16/96 02/20/96 Soil ug/Kg	062-\$-0009-01 062\$000901 142610 062\$000901 02/16/96 02/20/96 \$oil ug/Kg	
CAS # Parameter	1695 VAL	1695 VAL	1695 VAL	
108-95-2 Phenol bis(2-Chloroethyl)ether 95-57-8 2-Chlorophenol 1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,2-Dichlorobenzene 95-48-7 2-Methylphenol (o-Cresol) 2,2'-oxybis(1-Chloropropane) 4-Methylphenol (p-Cresol) N-Nitroso-di-n-propylamine Hexachloroethane Nitrobenzene 1sophorone 2-Nitrophenol 2,4-Dichlorophenol 120-83-2 120-82-1 91-20-3 1,2,4-Trichlorobenzene Naphthalene Hexachloroethoxy)methane 4-Chloro-3-methylphenol 2-Methylnaphthalene Hexachlorocyclopentadiene 2,4,6-Trichlorophenol 2,4,5-Trichlorophenol 2,4,5-Trichlorophenol 2,4,5-Trichlorophenol 2,4,5-Trichlorophenol 2,4,5-Trichlorophenol 2,4,5-Trichlorophenol 2,2,6-Dinitrotoluene 2,6-Dinitrotoluene 3-Nitroaniline Acenaphthylene 2,6-Dinitrotoluene 3-Nitroaniline Acenaphthene 2,4-Dinitrophenol 2,4-	410. U	400. U	410. U	
100-02-7 4-Nitrophenol 132-64-9 Dibenzofuran	1000. U 410. U	1000. U 400. U	1000. U 410. U	T1) 4

NSA MEMPHIS

NAS MEMPHIS, REI, ASSEMBLY C

Page: Time: 13:00

ORIGINAL ID> 06 LAB SAMPLE ID> 14	62-\$-0007-01				·					
SAMPLE DATE>	62\$000701 42608 162\$000701		062-S-0008-0 062S000801 142609 062S000801	11	062-S-0009- 062S000901 142610 062S000901	-01				
DATE ANALYZED> 02 MATRIX> So	12/16/96 12/20/96 Ioil Ig/Kg		02/16/96 02/20/96 Soil ug/Kg		02/16/96 02/20/96 Soil ug/Kg		i de la companya de l	1		
CAS # Parameter 16	695	VAL	1695	VAL	1695	VAL			4	
121-14-2 84-66-2 7005-72-3 86-73-7 100-01-6 534-52-1 2-Methyl-4,6-Dinitrophenol 86-30-6 101-55-3 118-74-1 87-86-5 85-01-8 120-12-7 86-74-8 206-44-0 129-00-0 85-68-7 91-94-1 56-55-3 218-01-9 117-84-0 205-99-2 207-08-9 50-32-8 193-39-5 110-01-6 2-Methyl-4,6-Dinitrophenol N-Nitrosodiphenylamine 4-Bromophenyl-phenylether Hexachlorobenzene Pentachlorophenol Phenanthrene Anthracene 8-74-8 20rabazole 84-74-2 206-44-0 129-00-0 85-68-7 91-94-1 56-55-3 218-01-9 117-84-0 205-99-2 207-08-9 50-32-8 193-39-5 10deno(1,2,3-cd)pyrene Dibenz(a,h)anthracene Benzo(g,h,i)perylene	410. 410. 410. 1000. 1000. 410. 410. 410. 410. 410. 410. 410. 410. 410. 410. 410. 410. 410. 410. 410. 410. 410. 410. 410.	ס ט ט ט ט ט ט ט ט ט ט ט ט ט ט ט ט ט ט ט	400. 400. 400. 1000. 1000. 400. 400. 400	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	410. 410. 410. 1000. 1000. 410. 410. 410					

DATALCP3 10/30/95

NAS MEMPHIS NAS MEMPHIS, RFI, ASSEMBLY C SWMU 62 - Primary Samples

Page: 1 Time: 11:27

1411 VAL 13. U 13. U 13. U 13. U 2. J 16. U 13. U 14. U 15. U 17. U 18. U 19.	1411 VAL 10. U	1411 VAL 12. U		
13. U 13. U 13. U 14. U 15. U 16. U 17. U 18. U 18. U 19. U	10. U 10. U 10. U 10. U 11. J 9. J 10. U	12. U		
13. U	10. U	12. U 12. U 12. U 12. U 12. UJ 12. UJ 12. U		
	13. UJ 13. U	13. UJ 10. U 13. U 10. U	13. UJ 10. U 12. UJ 13. U 10. U 12. U 13. U 10. U 12. U	13. UJ 10. U 12. UJ 13. U 10. U 12. U 13. U 10. U 12. U

Sample Location:62SG0103 Lab File ID:nas66.001 Calibration Std.:vc0515.001 Date: 05/15/95 Blank: blk0515.001 Dilution:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloraethene	BDL	BOL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BOL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	69.9	67. 7	
40,42	BOL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BOL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	12	12
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BOL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichtoropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	п/а	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachioroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:63SG0120 Lab File ID:nas67.001 Calibration Std.:vc0515.001 Date: 05/15/95 Blank: blk0515.001 Dilution:

ution:

	Concen.	Concen.	Blank	
Compound	PID (ppb)	Hall (ppb)	Concen.	
Vinyl Chloride	BDL	BDL		
1,1-Dichloroethene	BDL	BDL		
t-1,2-Dichloroethene	BDL	BDL		
c-1,2-Dichloroethene	BDL	BDL		
1,1-Dichloropropene	BDL	BDL		
Benzene	BDL	n/a		
Trichloroethene	BDL	BDL		
c-1,3-Dichloropropene	BDL	BDL		
t-1,3-Dichloropropene	BDL	BDL		
Toluene	BDL	n/a		
Tetrachloroethene	BDL	BDL		
Chlorobenzene	BDL	BDL		
Ethylbenzene	BDL	n/a		
m,p-Xylenes	BDL	n/a		
Styrene	BDL	n/a		
o-Xylene	BDL	n/a		
BFB (surrogate)	74	73.2		
40,42	BDL	n/a		
n-Propylbenzene	BOL	n/a		
2-Chlorotoluene	BDL	BDL		
4-Chlorotoluene	BDL	BDL		
1,3,5-Trimethylbenzene	BDL	n/a		
t-Butylbenzene	BDL BDL	n/a		
1,2,4-Trimethylbenzene		n/a		
s-butylbenzene/1,3-DCB	BDL	n/a		
1,4-Dichlorobenzene	BDL BDL	BDL n/a		
p-Isopropyltoluene 1,2-Dichlorobenzene	BDL BDL	BDL		
n-Butylbenzene	BDL	n/a		
1,2,4-Trichlorobenzene	BDL	BDL		
Naphthalene	BDL	n/a		
Hexachlorobutadiene	BDL	BDL		
1,2,3-Trichlorobenzene	BDL	BDL		
Dichlorofluoromethane	n/a	BDL		
Bromomethane	n/a	BDL		
Chloroethane	n/a	BDL		
Trichlorofluoromethane	n/a	BDL		
Methylenechloride	n/a	9 ຼ	12	
1,1-Dichloroethane	n/a	BDL		
Bromochioromethane	n/a	BDL		
Chloroform	n/a	BDL		
2,2-Dichloropropane	n/a	BDL		
1,2-Dichloroethane	n/a	BDL		
1,1,1-Trichloroethane	n/a	BDL		
Carbon Tetrachloride	n/a	BDL		
Dibromomethane	n/a	BDL		
1,2-Dichloropropane	n/a	BDL		
Trichloroethene	n/a	BDL		
Bromodichloromethane	n/a	BDL		
1,1,2-Trichloroethane	n/a	BDL		
1,3-Dichloropropene	n/a	BDL		
Dibromochloromethane	n/a	BDL		
1,2-dibromomethane	n/a	BDL		
1,1,1,2-Tetrachloroethane	n/a	BDL		
Bromoform	n/a	BDL		
41,43	n/a	BDL		
1,2-Dibromo-3-chloropropene	n/a	BDL		

HydroLogic Mobile Laboratory Analytical Results - Volatile Organic Compounds Memphis Naval Air Station

Sample Location:62GH0141 Lab File ID:nas65.001 Calibration Std.:vc0515.001 Date: 05/15/95 Blank: blk0515.001 Dilution:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichtoroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BOL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	85.8	105	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chloratoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
• •	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB		BDL	
1,4-Dichlorobenzene	BDL BDL		
p-Isopropyitoluene		n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	BDL	12
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL.	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	8DL	
Dibromochloromethane	n/a	BDL	
1.2-dibromomethane	n/a	BDL	
1.1.1.2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:062S002004 Lab File ID:NAS121.001 Calibration Std.:vc0522.001 Date: 05/22/95 Blank: blk0522.001 Dilution:

on:

_	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BOL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	60.4	51.2	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichtorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	10.	14
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:062S002020 Lab File ID:NAS120.001 Calibration Std.:vc0522.001 Date: 05/22/95 Blank: blk0522.001 Dilution:

0.887

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1.1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BOL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chiorobenzene	BDL	BDL	
	BDL	n/a	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL BDL	n/a n/a	
Styrene			
o-Xylene	BDL	n/a	
BFB (surrogate)	67.2	68.8	
40,42	BDL	n/a - /-	
n-Propylbenzene	5.3	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-isopropyitoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	6	14
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
	n/a	BDL	
1,2-Dichloropropane Trichloroethene	n/a n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane		BDL	
• •	n/a		
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1 1 1 2 Totrachloroothana	n/a	BDL	
1,1,1,2-Tetrachloroethane		001	
Bromoform 41,43	n/a n/a	BDL BDL	

Sample Location:062S003003 Lab File ID:NAS152.001 Calibration Std.:vc0526.001 Date: 05/26/95 Blank: blk0526.001 Dilution:

1:

	Concen.	Concen.	Blank
ompound	PID (ppb)	Hall (ppb)	Concen.
nyl Chloride	BDL	BDL	
1-Dichloroethene	BDL	BDL	
1,2-Dichloroethene	BDL	BDL	
1,2-Dichloroethene	BDL	BDL	
1-Dichloropropene	BDL	BDL	
enzene	BDL	n/a	
richloroethene	BDL	BDL	
1,3-Dichloropropene	BDL	BDL	
1,3-Dichloropropene	BDL	BDL	
oluene	BDL	n/a	
etrachioroethene	BOL	BOL	
hlorobenzene	BDL	BDL	
thylbenzene	BDL	n/a	
,p-Xylenes	BDL	n/a	
tyrene	BDL	n/a	
-Xylene	BDL	n/a	
FB (surrogate)	76.9	24.9	
0,42	BDL	n/a	
-Propylbenzene	BDL	n/a	
-Chlorotoluene	BDL	BDL	
-Chlorotoluene	BDL	BDL	
,3,5-Trimethylbenzene	BDL	n/a	
Butylbenzene	BDL	n/a	
,2,4-Trimethylbenzene	BDL	n/a	
-butylbenzene/1,3-DCB	BDL.	n/a	
4-Dichlorobenzene	BDL	BDL	
-isopropyltoluene	BDL	n/a	
,2-Dichlorobenzene	BDL	BDL	
-Butylbenzene	BDL	n/a	
,2,4-Trichlorobenzene	BDL	BDL	
aphthalene	BDL	n/a	
exachiorobutadiene	BDL	BDL	
,2,3-Trichlorobenzene	BDL	BDL	
ich(orofluoromethane	n/a	BDL	
romomethane	п/а	BDL	
hloroethane	n/a	BDL	
richlorofluoromethane	n/a	5	16
lethylenechloride	n/a	25	17
,1-Dichloroethane	n/a	BDL	
romochloromethane	n/a	BDL	
chloroform	n/a	BDL	
,2-Dichloropropane	n/a.	BDL	
,2-Dichloroethane	n/a.	BDL BDL	
,1,1-Trichloroethane	n/a	BDL	
,1,1-Trichloroethane arbon Tetrachloride	n/a n/a	BDL	
	n/a n/a	BDL	
ibromomethane	n/a	BDL	
,2-Dichloropropane		BDL	
richloroethene	n/a . n/a	BDL	
romodichloromethane	•		
,1,2-Trichloroethane	n/a	BDL	
,3-Dichtoropropene	n/a	BDL	
ibromochloromethane	n/ a	BDL BDL	
	n/a	BDL	
,2-dibromomethane		201	
,1,1,2-Tetrachloroethane	n/a	BDL	
	n/a n/a n/a	BDL BDL BDL	

Sample Location:062S003019 Lab File ID:NAS153.001 Calibration Std.:vc0526.001 Date: 05/26/95 Blank: blk0526.001 Dilution:

ion:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BOL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	8DL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachioroethene	BDL	BDL	
Chiorobenzene	BDL	BDL	
Ethylbenzene	BDL	п/а	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	81.5	25.9	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-IsopropyItoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	16
Methylenechloride	n/a	24	17
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichtoroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:062S004003 Lab File ID:NAS150.001 Calibration Std.:vc0525.001 Date: 05/25/95 Blank: blk0525.001 Dilution:

on:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BOL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BOL	BDL	
Ethylbenzene	BDL	n/a	
•	BDL		
m,p-Xylenes	BDL .	n/a -/-	
Styrene		n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	78.4	99.3	
40,42	BDL	n/a.	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	8_	16
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane		BDL	
1,2-Dichloroethane	n/a. n/a	BDL	
1,1,1-Trichloroethane Carbon Tetrachloride	n/a n/a	BDL BDL	
	n/a		
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichtoroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:062S004020 Lab File ID:NAS149.001 Calibration Std.:vc0525.001 Date: 05/25/95 Blank: blk0525.001 Dilution:

	Concen.	Concen.	Blank
Compound	PiO (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BOL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BOL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	83	110	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chiorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BOL	BDL	
p-IsopropyItoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	п/а	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	8 ့	16
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/ a	BDL	
Dibromochloromethane	n/ a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachioroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:062G004042 Lab File ID:NAS148.001 Calibration Std.:vc0525.001 Date: 05/25/95 Blank: blk0525.001 Dilution:

on:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	8DL	
1,1-Dichloroethene	BDL	BDL	
:-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichtoropropene	BDL	BDL	
Benzene	BDL	n/a	
Frichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
-1,3-Dichloropropene	BDL	BDL	
l'oluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
n,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
>-Xylene	BDL	n/a	
3FB (surrogate)	94.5	139	
10,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
o-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	8DL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	BOL	16
1,1-Dichloroethane	n/a	BOL	
Bromochloromethane	n/a	BOL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BOL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
richloroethene	n/a	BDL	
Bromodichloromethane	п/а	BDL	
1,1,2-Trichloroethane	n/a	BOL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:062S005003 Lab File ID:NAS123.001 Calibration Std.:vc0522.001 Date: 05/22/95 Blank: blk0522.001 Dilution:

ion:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BOL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	53.2	37.5	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechioride	n/a	14	14
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	п/а	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BOL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	8DL	
Bromodichloromethane	п/а	BDL	
1,1,2-Trichloroethane	n/a	BOL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

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Sample Location:062S005003 Lab File ID:NAS123A.001 Calibration Std.:vc0524.001 Date: 05/24/95 Blank: blk0524.001 Dilution:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	8DL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	63.5	28.2	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyitoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichtorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	32	15
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BOL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1.1.2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a n/a	BDL	
Dibromochioromethane	n/a n/a	BDL	
1,2-dipromomethane 1,1,1,2-Tetrachloroethane	n/a. n/a.	BDL	
1,1,1,2-Tetrachioroethane Bromoform	n/a. n/a.	BDL	
41,43	n/a	BDL BDI	
,2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:062S005020 Lab File ID:NAS122.001 Calibration Std.:vc0522.001 Date: 05/22/95 Blank: blk0522.001 Dilution:

Ullution:

	Concen.	Concen.	Blank
Compound	PiD (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1~Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BOL	
Toluene	BDL	n/a	
Tetrachioroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	65.8	58.1	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butyibenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BOL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	9_	14
1,1-Dichloroethane	n/a	BDL	1-7
Bromochloromethane	n/a	BDL	
		BDL	
Chloroform	n/a n/a	BDL BDL	
2,2-Dichloropropane		BDL	
1,2-Dichloroethane	n/a		
1,1,1-Trichloroethane	n/a	BDL BDL	
Carbon Tetrachloride	n/a		
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichtoroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL.	
Dibromochloromethane	n/a	BDL.	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:062G005041 Lab File ID:NAS119.001 Calibration Std.:vc0522.001 Date: 05/22/95 Blank: blk0522.001 Dilution:

ilution:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
/inyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichtoroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL.	n/a	
m,p-Xylenes	BOL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	73.9	76.1	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BOL	BDL	
p-Isopropyitoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a.	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	6,	14
1.1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a.	BDL	
1,1,2-Trichtoroethane	n/a	BDL	
	n/a	BDL	
1,3-Dichloropropene	n/a n/a	BDL	
Dibromochloromethane			
1,2-dibromomethane	n/a n/a	BDL	
4 4 4 A Takanahlan	T1 / F8	BDL	
1,1,1,2-Tetrachloroethane			
1,1,1,2-Tetrachloroethane Bromoform 41,43	n/a n/a	BDL BDL	

Sample Location:062S006003 Lab File ID:NAS124.001 Calibration Std.:vc0522.001 Date: 05/22/95 Blank: blk0522.001

...

Dilution:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BOL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL.	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	59.5	47.4	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BOL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	8DL	
Methylenechloride	n/a	14.	14
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL.	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachtoride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BOL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

Sample Location:062S006020 Lab File ID:NAS125.001 Calibration Std.:vc0522.001 Date: 05/22/95 Blank: blk0522.001 Dilution:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
/inyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
-1,2-Dichloroethene	BDL	BDL	
:-1,2-Dichloroethene	BOL	BDL	
,1-Dichloropropene	BOL	BDL	
Benzene	BDL	n/a	
Frichloroethene	BDL	BDL	
-1,3-Dichloropropene	BDL	BDL	
-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BOL	BDL	
Ethylbenzene	BDL	n/a	
n,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
Xylene	BDL	n/a	
3FB (surrogate)	55.7	39.7	
10,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BOL	BDL	
,3,5-Trimethylbenzene	BDL	n/a	
-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
,4-Dichlorobenzene	BDL	BDL	
-Isopropyltoluene	BDL	n/a	
,2-Dichtorobenzene	BDL	BDL	
-Butylbenzene	BDL	n/a	
,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
-lexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a.	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	12.	14
,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
,2-Dichloropropane	n/a	BDL	
Trichtoroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
n,3-Dichloropropene Dibromochloromethane	n/a n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1.2-GIDIONIUNEUI&/18		BDL	
1,1,1,2-Tetrachloroethane	n/a n/a		
	n/a n/a n/a	BDL BDL	

...<u>.</u>

Sample Location:062G006038 Lab File ID:NAS118.001 Calibration Std.:vc0522.001

Date: 05/22/95 Blank: blk0522.001 Dilution:

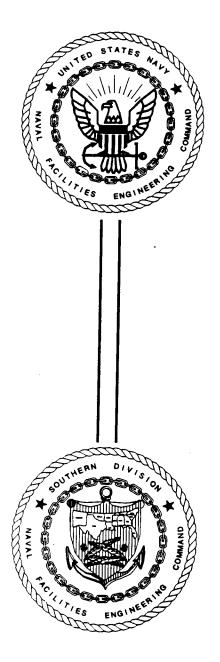
n:

	Concen.	Concen.	Blank
Compound	PID (ppb)	Hall (ppb)	Concen.
/inyl Chloride	BDL	BDL	
I,1-Dichloroethene	BDL	BDL	
-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
richloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
n,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
3FB (surrogate)	77,5	87.8	
10,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
I-Chlorotoluene	BDL	BDL	
,3,5-Trimethylbenzene	BDL	n/a	
-Butylbenzene	BDL	n/a	
,2,4-Trimethylbenzene	BDL	n/a	
:-butylbenzene/1,3-DCB	BDL	n/a	
,4-Dichlorobenzene	BDL	BDL	
	BDL	n/a	
,2-Dichlorobenzene	BDL	BDL	
	BDL		
n-Butylbenzene	BDL	n/a BDL	
,2,4-Trichlorobenzene			
laphthalene	BDL	n/a	
lexachlorobutadiene	BDL	BDL	
,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	5	14
,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
,2-Dichloroethane	n/a	BDL	
,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
,2-Dichloropropane	n/a	BDL	
richloroethene	n/a	BDL	
3romodichloromethane	n/a	BDL	
,1,2-Trichloroethane	n/a	BDL	
,3-Dichloropropene	n/a	BDL	
	-/-	BDL	
Dibromochloromethane	n/a		
·	n/a n/a	BDL	
Dibromochloromethane		BDL BDL	
Dibromochloromethane ,2-dibromomethane	n/a		
libromochloromethane ,2-dibromomethane ,1,1,2-Tetrachloroethane	n/a n/a	BDL	

Attachment 1

Data Validation Report





CTO-094

Contract No: N62467-89-D-0318

Prepared for:

Department of the Navy Southern Division Naval Facilities Engineering Command North Charleston, South Carolina

Prepared by:

EnSafe/Allen & Hoshall 5720 Summer Trees Drive, Suite 8 Memphis, Tennessee 38134 (901) 383-9115

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		Blanks			

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1.0 INTRODUCTION

This report presents the analytical data collected during the Confirmatory Sampling Investigation of Naval Support Activity (NSA) Memphis Assembly C Solid Waste Management Units (SWMUs) 26, 27, and 62 and the quality assurance/quality control (QA/QC) evaluation of those data. The purpose of the data evaluation is to verify that the QC requirements of the data set have been met and to characterize the weakness of any questionable data.

The Assembly C soil and groundwater samples were collected at NSA Memphis during May and June 1995, and February and March 1996; submitted to National Environmental Testing, Inc., laboratory in Bedford, Massachusetts; and reported using U.S. Environmental Protection Agency (USEPA) Data Quality Objectives (DQO) Level III and IV equivalents. The analytical methods and DQO laboratory deliverables are summarized in Table 1-1.

Table 1-1 NSA Memphis Analytical Program

Analytical Method	Data Quality Level	Method Reference	Site
		Full Scan	
Volatile Organic Compounds	IV	SW-846 8240	SWMUs 27, 62
Semivolatile Organic Compounds	IV	SW-846 8270	SWMUs 26, 27, 62
Pesticide/Polychlorinated biphenyls	IV	SW-846 8080	SWMUs 26, 27, 62
Metals	IV	40 CFR Part 264 Appendix IX (SW-846 6010/7060/7421/7471/7740/7841)	SWMUs 26, 27, 62

Note:

CFR = Code of Federal Regulations

The references for the methods listed in Table 1-1 were obtained from the following sources:

 USEPA Office of Solid Waste and Emergency Response (OSWER), Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Third Edition, revised July 1992.

- USEPA Environmental Monitoring and Support Laboratory, *Methods for Chemical Analysis of Water and Wastes* (EPA-600/4-79-020, revised March 1983).
- USEPA Title 40 Code of Federal Regulations Part 264, Appendix IX (52 Federal Register 25947, July 1987).

Data were validated using the following documents (as appropriate):

- USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, February 1994 (EPA-540/R-94/012). OSWER.
- USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, February 1994, (EPA-540/R-94/013). OSWER.

The NSA Memphis data were validated by either EnSafe/Allen and Hoshall (E/A&H) or E/A&H's subcontractors, Validata Chemical Services of Norcross, Georgia, or Heartland Environmental Services, Inc., of St. Charles, Missouri. The data were validated at DQO Level III. The data validation findings were summarized separately for each sample delivery group (SDG). Each SDG usually contained 20 samples of one matrix type, i.e., either a solid (soil and/or sediment) or water (groundwater and/or surface water) samples, except for QC samples. The validation summary reports and data summary tables are included in Attachment A to this document.

The following sections discuss the significant data validation findings for each SWMU. The following outlines the SWMUs for this project and the analytical parameters associated with each.

Data Validation Summary of the Investigative Samples:

Section 2	Organic and Metals Data	SWMU 26
Section 3	Organic and Metals Data	SWMU 27
Section 4	Organic and Metals Data	SWMU 62

1.1 Organic Evaluation Criteria

The USEPA methods described in the following define QC criteria that the laboratory must meet but the methods do not address data evaluation from a user's perspective:

- Test Methods for Evaluating Solid Waste, Physical/Chemical Methods
- Methods for Chemical Analysis of Water and Wastes.

Evaluation criteria are available in *USEPA Contract Laboratory National Functional Guidelines* for Organic Data Review (Organic Functional Guidelines), February 1994, which was used throughout the data evaluation process when the analytical methods did not address data usability.

Data evaluation for samples collected at NSA Memphis included the following parameters:

- Holding times
- Gas chromatograph/mass spectrometry (GC/MS) instrument performance checks
- Surrogate spike recoveries
- Instrument calibration
- Matrix spike and matrix spike duplicates (MS/MSD)
- Blank analysis
- Internal standard performance
- Compound quantitation
- Field duplicate precision

According to Organic Functional Guidelines, when the QC parameters do not fall within the specific method guidelines, the data evaluator annotates or "flags" the corresponding compounds where deficiencies were found. The data from NSA Memphis were evaluated using this approach. The following flags were used to annotate data with laboratory and/or field deficiencies or problems:

- U Undetected The analyte was analyzed for but not detected or was also found in an associated blank, but at a concentration less than 10 times the blank concentration for common laboratory constituents (contaminants) or five times the blank concentration for other constituents; the associated value shown is the Practical Quantitation Limit (PQL).
- J Estimated Value One or more QC parameters were outside control limits or the concentration of the analyte was less than the PQL.
- UJ Undetected and Estimated The analyte was analyzed for but not detected above the listed estimated quantitation limit; the quantitation limit is estimated because at least one QC parameter was outside control limits.
- Diluted Result The compound was reanalyzed at a secondary dilution factor. If at least one compound was outside the calibration range during an initial analysis, the laboratory flags the analyte "E." When diluted, the sample results will be flagged "D." Generally, values from the initial analysis will be used except where the value exceeded the calibration range. Values exceeding the calibration range in the initial analysis will be substituted by the diluted value to ensure the most representative data. The "D" flag will remain on the value to alert the data user that the secondary dilution value was used.

R/UR Unusable Data — At least one QC parameter grossly exceeded control limits.

These validation flags were applied to data where data deficiencies were noted. Attachment A includes tables of all qualified data.

1.1.1 Holding Times

Acceptable technical holding times are specified in the analytical methods. The sample holding time depends on the type of analysis and whether the sample was preserved. For water samples, the holding time for preserved volatile organic compound (VOC) analysis is 14 days from the collection date. Semivolatile organic compound (SVOC) and pesticide/polychlorinated biphenyl (PCB) water samples must be extracted within seven days and analyzed within 40 days after extraction. Holding times for soil matrices are not specified in SW-846. Therefore, data reviewers can apply the water sample holding times criteria to soil at their discretion.

1.1.2 GC/MS Mass Calibration (Instrument Performance Checks)

Tuning and performance criteria are established to ensure that the data produced by the instrument may be correctly interpreted according to the requirements of the method being used. These criteria are not sample specific; conformance is determined using standard materials. Therefore, these criteria must be met in all circumstances. The performance standards for VOC (bromofluorobenzene [BFB]) and SVOC (decafluorotriphenylphosphine [DFTPP]) analyses are evaluated to determine if the data produced by the instrument may be correctly interpreted according to the method requirements. Performance standards must be analyzed within 12 hours of sample analysis, and the results must be within the established criteria.

1.1.3 Surrogate Spike Recoveries

Surrogate compounds are added to samples and laboratory blanks before extraction and sample preparation to evaluate the effect of the sample matrix on extraction and measurement procedures. Surrogates are organic compounds which are chemically similar to analytes of interest but not normally found in environmental samples. Three surrogate compounds are added to samples for VOC analysis, eight are added to samples for SVOC analysis, and two are added

to pesticide/PCB samples. Percent recovery (%R) of the surrogates is calculated by comparing the amount of the compound recovered by the analysis to the amount added to the sample.

Below is a list of surrogate compounds recommended by the SW-846 methods.

VOC Surrogates	SVOC Surrogates
Toluene-d8 (TOL)	Nitrobenzene-d5 (NBZ)
BFB	2-Fluorobiphenyl (FBP)
1,2-Dichloroethane (DCE)	Terphenyl-d14 (TPH)
	2,4,6-Tribromophenol (TBP)
Pesticide/PCB Surrogates	Phenol-d5 (PHL)
Tetrachloro-m-xylene (TCMX)	2-Chlorophenol-d4 (2CP)
Decachlorobiphenyl (DCB)	1,2-Dichlorobenzene-d4 (DCB)

1.1.4 Instrument Calibration

Instruments are initially and continually calibrated with standard solutions to verify that they are capable of producing acceptable quantitative data for the compounds.

Initial calibration (GC/MS): The instrument is initially calibrated at the beginning of the analytical run to check its performance and to establish a linear five-point calibration curve. The initial calibration is verified by calculating the relative response factor (RRF) and the percent relative standard deviation (%RSD) for each compound. An RRF less than 0.05 or a %RSD greater than 30% is outside the QC limits for the initial calibration.

Continuing calibration (GC/MS): Standard solutions are run periodically to check the daily performance of the instrument and to establish the 12-hour RRF on which the sample quantitations are based. The continuing calibration is verified by calculating the RRF and the

percent difference (%D) for each compound. An RRF less than 0.05 or a %D greater than 25% is outside the QC limits for the continuing calibration.

Initial calibration (GC): For single-component pesticides, two separate standard mixes are used, five-point calibrations are analyzed, and calibration factors (CF) are established. The CF for single-component pesticides must be less than or equal to 20%.

The multicomponent pesticide toxaphene and all PCBs (or Aroclors) are analyzed separately. Retention times and CFs are determined for three to five primary peaks. The only review criteria for multicomponent compounds is to verify these steps were taken.

Continuing calibration (GC): To confirm the calibration and evaluate instrument performance for single-component pesticides, calibration verification consisting of instrument blank, performance evaluation mixtures, and the midpoint concentration of the two standard mixes are analyzed. The %D between the calculated amount and the true amount must not exceed 15% on the primary column.

Multicomponent compounds do not require continuing calibration.

1.1.5 Matrix Spikes/Matrix Spike Duplicates

The MS, which is used to determine the accuracy of the analysis for a given matrix, consists of a known quantity of stock solution added to the sample before its preparation and analysis. Evaluating the MS data involves two calculations. First, the is calculated by comparing the amount of the compound recovered by the analysis to the amount added to the sample. In addition, the relative percent difference (RPD) between the MS and the MSD samples is calculated and assessed. No specific requirements have been established for qualifying MS/MSD data. However, guidelines to aid in applying professional judgment are discussed in Organic Functional Guidelines.

1.1.6 Laboratory Control Samples and Laboratory Duplicates

Some GC methods may require that a laboratory control sample (LCS) and laboratory duplicate analysis be performed with each SDG. The LCS monitors the overall performance of each step during analysis, including sample preparation. All aqueous LCS %R results must fall within the control limits established by the laboratory. Laboratory duplicate samples are used to demonstrate acceptable method precision at the time of analysis. The RPD between the sample and the duplicate sample is calculated. Although no guidelines are established for organic laboratory duplicates, sample qualification is left up to professional judgment.

1.1.7 Blank Analysis

Laboratory method blanks are used to assess the existence and magnitude of potential contamination introduced during analysis. Additionally, field blanks may be collected to assess any contamination introduced while collecting samples. When chemicals are found both in samples and laboratory blanks analyzed within the same 12-hour period and/or field-derived blanks, the usability of the data depends on the reviewer's judgment and the blank's origin. According to Organic Functional Guidelines, a sample result should not be considered positive unless the concentration of the compound in the sample exceeds 10 times the amount in any blank for common laboratory contaminants (i.e., methylene chloride, acetone, 2-butanone, and common phthalate esters), or five times the amount for other constituents. These amounts are referred to as action levels (ALs). Because blank samples may not be prepared using the same weight, dilution or volume of sample, these factors also should be considered when using these blank criteria. The specific actions to be taken are as follows:

- If a chemical is found in the blank but not the sample, no action is taken.
- If the sample concentration is less than the quantitation limit and less than the AL, the quantitation limit is reported.

- If the sample concentration is between the quantitation limit and the AL, the concentration is reported as nondetect "U."
- If the sample concentration is greater than the AL, the concentration may be used unqualified.

Field-Derived Blanks

For this project, three types of field-derived blanks were collected: the *field blank*, the *equipment rinsate blank* (also called a *rinsate blank*), and the *trip blank*. The field blank is a sample of the source water used onsite, primarily to decontaminate equipment. The equipment rinsate blank is a sample of runoff water from one or more pieces of the decontaminated equipment used to collect samples. The trip blank is a 40-milliliter volatile organic analysis (VOA) vial filled at the laboratory with certifiable water to assess cross-contamination during VOC sample container shipment and handling both before and after the samples are collected.

The frequencies for collecting these QC samples were defined in Section 4 of the NSA Memphis Comprehensive RFI Work Plan (E/A&H, October 1994) as follows:

- Field blanks one per source of water per sampling event.
- Rinsate blank one per week.
- Trip blank one per shipment containing samples for VOAs.

For data validation, each trip blank is associated only with the samples from the same shipment/cooler. The field blanks and the rinsate blanks apply to a larger number of samples because only one is collected per sampling event. Because field-derived blanks are used with method blanks to assess potential cross-contamination of field investigative samples, no action was taken if contamination was detected in the method blanks associated with the field-derived

blanks. Most rinsate and field blanks collected for Assembly C were sent to the onsite laboratory during direct push technology (DPT) work.

1.1.8 Internal Standard Performance

GC/MS internal standards are added to samples to ensure the stability of the instrument's sensitivity and response during each analytical VOC and SVOC run. Internal Standard area counts for samples and blanks must not vary more than a factor of two (-50% to +100%) from the associated calibration standard. If an Internal Standard area count is outside this window, action should be taken.

Listed below are the internal standard compounds recommended by the methods.

1	ZO	C	Compounds	

SVOC Compounds

Bromochloromethane (BCM)

1,4-Dichlorobenzene-d4 (DCB)

1,4-Difluorobenzene (DFB)

Naphthalene-d8 (NPT)

Chlorobenzene-d5 (CBZ)

Acenaphthene-d10 (ANT)

Phenanthrene-d10 (PHN)

Chrysene-d12 (CRY)

Perylene-d12 (PRY)

1.1.9 Field Duplicate Precision

One field duplicate was collected at NSA Memphis for each 10 water and/or soil or sediment samples collected. Field duplicate samples are analyzed to evaluate data precision, which measures the reproducibilty of the analysis.

For the NSA Memphis Resource Conservation and Recovery Act Facility Investigation (RFI), RPDs between the samples and duplicates were calculated during the validation processes for sample results above the PQL. If the results for any compounds did not meet RPD criteria of

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less than 30% for water and less than 50% (Validata used a control limit of 60%) for soil or sediment, the positive results for that compound were flagged as estimated for the sample and duplicate only. If one value was nondetected and the other value was above the PQL, the positive result was flagged as estimated "J," and the nondetected result as estimated "UJ."

1.2 Inorganic Evaluation Criteria

The USEPA methods described in Test Methods for Evaluating Solid Waste, Physical/Chemical Methods and Title 40 Code of Federal Regulations Part 264, Appendix IX define QC criteria that the laboratory must meet, but the methods do not address data evaluation from a user's perspective. Evaluation criteria are available in USEPA Contract Laboratory National Functional Guidelines for Inorganic Data Review (Inorganic Functional Guidelines), February 1994, which was used throughout the data evaluation process when the analytical methods did not address data usability.

Data evaluation for samples collected at NSA Memphis included the following parameters:

- Holding times
- Instrument calibration
- MS results
- Laboratory duplicates
- Blank analysis
- Inductively Coupled Plasma (ICP) interference check samples
- ICP serial dilutions
- LCS results
- Atomic Absorption (AA) duplicate injections and postdigestion spike recoveries
- Field duplicate precision

According to Inorganic Functional Guidelines, when the QC parameters do not fall within the specific method guidelines, the data evaluator annotates or "flags" the corresponding deficient compounds. The data from NSA Memphis were evaluated using this approach. The following flags were used to annotate data exhibiting laboratory and/or field deficiencies or problems:

- U Undetected The analyte was analyzed for but not detected above the instrument detection limit (IDL) or was also found in an associated blank at a concentration less than five times the blank concentration. The IDL is described as the lowest possible concentration an instrument can detect a particular analyte.
- J Estimated Value At least one QC parameter was outside control limits or the analyte's concentration was less than the PQL.
- UJ Undetected and Estimated The analyte was analyzed for but not detected above the listed estimated IDL; the IDL is estimated because at least one QC parameter was outside control limits.

R/UR Unusable Data — One or more QC parameters grossly exceeded control limits.

1.2.1 Holding Times

Acceptable technical holding times are specified in the analytical methods. For aqueous samples, the holding time for metals analysis is six months, except for mercury, which is 28 days from the date of collection. Holding times for soil matrices are not specified in the methods. Therefore, data reviewers may apply the water sample holding times criteria to soil at their discretion.

1.2.2 Instrument Calibration

Initial and continuing calibrations of the instruments with standard solutions are used to check that the instrument is capable of producing acceptable qualitative and quantitative data for the analytes on the Appendix IX list.

An initial calibration is performed to check the performance of the instrument at the beginning of the analytical run and to establish a linear calibration curve. Calibration standard solutions are analyzed periodically to check the instrument performance and confirm that the initial calibration curve is still valid. Calibrations are verified by calculating the %R and comparing the amount of the analyte recovered by analysis to the known amount of standard. The %R for metals, except for mercury, should fall between 90% and 110%. The %R for mercury should fall between 80% and 120%.

1.2.3 Blank Analysis

Laboratory method blanks are used to assess the existence and magnitude of potential contamination introduced during analysis. Additionally, field blanks may be collected to assess the potential contamination introduced during sample collection. When chemicals are found in samples and laboratory blanks, the usability of the data depends on the reviewer's judgment and the blank's origin. According to Inorganic Functional Guidelines, a sample result should not be considered positive unless the concentration of the compound in the sample exceeds five times the amount in any blank, referred to as ALs. Because blank samples may not be prepared using the same weight, dilution or volume of sample, these factors also should be considered when using these blank criteria. The specific actions to be taken are as follows:

- If a chemical is found in the blank but not the sample, no action is taken.
- If the sample concentration is between the IDL, and less than the AL, the concentration is reported as "U."

• If the sample concentration is greater than the AL, the concentration may be used unqualified.

1.2.4 ICP Interference Check Samples

The ICP interference check sample is used to confirm the laboratory instrument's inter-element and background correction factors. Interference samples should be run at the beginning and end of each sample analysis run or at least twice per eight-hour working shift. The percent recoveries for the interference check sample should fall between 80% and 120%.

1.2.5 Laboratory Control Samples

LCSs are used to monitor the overall performance of steps in the analysis, including the sample preparation. All aqueous LCS percent recovery results must fall within the control limits of 80% to 120%, except for antimony and silver for which control limits have not been established. Soil LCS standards are generally provided by the USEPA (or state agency or private laboratory). Control limits are established for each soil LCS standard prepared.

1.2.6 MS Analysis

Samples are spiked with known quantities of analytes to evaluate the effect of the sample matrix on digestion and measurement procedures. The %R should be within 75% to 125%. However, when the sample concentration exceeds the spike concentration by a factor of four or more, spike recovery criteria are not applicable.

1.2.7 Laboratory Duplicates

Laboratory duplicate samples are analyzed to evaluate data precision, a measure of the reproducibilty of the analysis. The RPD between the sample and the duplicate sample is calculated. A control limit of 20 RPD for aqueous samples and 35% for soil or sediment samples should not be exceeded for analyte values greater than the quantitation limit or two times the quantitation limit, respectively.

1.2.8 ICP Serial Dilutions

ICP serial dilutions assess the absence or presence of matrix interference. One sample from each set of similar matrix type is chosen for the serial dilution (a five-fold dilution). For an analyte concentration that is at least a factor of 10 times above the instrument detection limit, the measured concentrations of the undiluted sample and of the diluted sample should agree within 10%.

1.2.9 AA Duplicate Injections and Postdigestion Spike Recoveries

During AA analysis, duplicate injections and postdigestion spikes are used to assess precision and accuracy of the laboratory analysis. The %RSD of duplicate injections must agree within 20%. Percent recovery of the postdigestion spike sample should fall between 85% and 115%.

1.2.10 Field Duplicate Precision

One field duplicate was collected for each 10 water and/or soil samples collected. Field duplicate samples are analyzed to evaluate data precision, which is a measure of the reproducibilty of the analysis.

For the NSA Memphis RFI, RPDs between the samples and duplicates were calculated during the validation processes for sample results above the PQL. If the results for any compounds did not meet RPD criteria of less than 30% for water and less than 50% (Validata used a control limit of 60%) for soil or sediment, the positive results for that compound were flagged as estimated for the sample and duplicate only. If one value was nondetected and the other value was above the PQL, the positive result was flagged as estimated "J," and the nondetected result as estimated "UJ."

2.0 DATA VALIDATION RESULTS — SWMU 26

All samples were received by the laboratory intact and with the proper documentation. Table 2-1 summarizes the samples that were included in SWMU 26.

Table 2-1 SWMU 26 Sample IDs

Sample IDs	SVOCs	Pest/PCBs	Appendix IX Metals	Arsenic, Cadmium, Lead, Mercury, &	
026S000104			1 1 1	X	
0268000108				X	
026\$000118					
026S000204				X	
026S000208				X	
026S000218				X	
026S000304				X	
026S000308				X	
026S000318				X	
026S000404				X	
026S000408				\mathbf{x}	
026S000415				X	
026S000501	X	X	X	n de de la companya de la companya La companya de la co	

Thirteen investigative samples were analyzed in two SDGs for SWMU 26. Full validation reports of each SDG and data tables can be found in Attachment A.

2.1 Data Quality

The overall data quality of the analytical work performed for NSA Memphis at SWMU 26 was considered satisfactory and usable for site remediation and risk assessment. Results that were outside QA/QC requirements were flagged as estimated "J," indicating that the data could be biased either high or low. Although the data are qualified as estimated, they remain dependable for use in risk assessment and site remediation.

2.2 Blanks

Arsenic, barium, cadmium, copper, lead, and zinc were detected in several method blanks. The blanks were examined during the validation process and sample results for arsenic, barium, cadmium, copper, lead, and zinc believed to be from blank contamination were nullified.

2.3 Unusable Data

One element in one sample was rendered unusable because it grossly exceeded a QC parameter. Table 2-2 summarizes the unusable data and explains the qualification.

Table 2-2 SWMU 26 Unusable Data

Sample ID	Fraction	Analyte(s)	Reason
026S000501	Metals	Antimony	MS percent recovery

3.0 DATA VALIDATION RESULTS — SWMU 27

All samples were received by the laboratory intact and with the proper documentation. Table 3-1 summarizes the samples that were included in SWMU 27.

Table 3-1 SWMU 27 Sample IDs

Sample IDs	VOC	SVOC	Pest/PCB	APP IX Metals
0278000101		x	x	A Color of the Col
027S000105				X
0278000114				X
027S000201		X	X	X
0278000206				\mathbf{x}
027S000212				X
0278000301				

Table 3-1 SWMU 27 Sample IDs

Sample IDs	VOC	SVOC	Pest/PCB	APP IX Metals
027S000306				X
027S000312				X
0278000401				x
027S000406				X
027S000412				X
027S000501		X	X	X
027S000506				\mathbf{x}
027S000512				X
027C000512	X			X
027H000545	X			
0278000601				X
027S000606				X
027\$000612				X
027S000701				X
027S000706				X
027S000712				X
027S000801				X
027\$000806				X
027C000806	X			X
027S000812				X
027C000812	X			X
027S000901				X
0278000906				X
027S000912				X
027H000944	X			

Thirty-two investigative samples were analyzed in four SDGs for SWMU 27. Full validation reports of each SDG and data tables can be found in Attachment A of this document.

3.1 Data Quality

The overall data quality of the analytical work performed for NSA Memphis at SWMU 27 was considered satisfactory and usable for site remediation and risk assessment. Results that were outside QA/QC requirements were flagged as estimated "J," indicating that the data could be biased either high or low.

3.2 Unusable Data

Three elements in 21 samples were rendered unusable because they grossly exceeded QC parameters. Table 3-2 summarizes the unusable data and explains the qualification.

Table 3-2 SWMU 27 Unusable Data

Sample ID	Fraction	Analyte(s)	Reason
027S000301 027S000306	Metals	Silver	MS percent recovery
027S000312 027S000406		Selenium	
027S000412 027S000506			
027S000512 027C000512			
027S000601 027S000606			
027S000612 027S000706			
027S000712 027S000801	Metals	Silver	MS percent recovery
027S000806 027C000806		Selenium	
027S000401 027S000501	Metals	Selenium	MS percent recovery
0278000701			
027S000114 027S000212	Metals	Antimony	MS percent recovery

3.3 Blanks

Methylene chloride, arsenic, selenium, antimony, silver, cobalt, copper, cadmium, chromium, thallium, tin, and zinc were detected in several method and field blanks. The blanks were

examined during the validation process and sample results for methylene chloride, arsenic, selenium, antimony, silver, cobalt, copper, cadmium, chromium, thallium, tin, and zinc believed to be from blank contamination were nullified.

4.0 DATA VALIDATION RESULTS — SWMU 62

All samples were received by the laboratory intact and with the proper documentation. Table 4-1 summarizes the samples that were included in SWMU 62.

Table 4-1 SWMU 62 Sample IDs

Sample IDs	SVOCs	Pest/PCBs	Appendix IX Metals	VOC	
062C002020				X	
062C005020				X	
062H005041					
062C006020				X	
0628000701	X	X	x		
062S000801	X	X	X		
062S000901	X	X	X		

Seven investigative samples were analyzed in two SDGs for SWMU 62. Full validation reports of each SDG and data tables can be found in Attachment A.

4.1 Data Quality

The overall data quality of the analytical work performed for NSA Memphis at SWMU 62 was considered satisfactory and usable for site remediation and risk assessment. Results that were outside QA/QC requirements were flagged as estimated "J," indicating that the data could be

biased either high or low. Although the data are qualified as estimated, they remain dependable for use in risk assessment and site remediation.

4.2 Blanks

Acetone and methylene chloride were detected in several method blanks. The blanks were examined during the validation process and sample results for acetone and methylene chloride believed to be from blank contamination were nullified.

Attachment A Data Validation Summary Narratives and Data Tables

SWMU 26

DATA QUALIFICATION SUMMARY

NET, Inc. - 1439 Inorganics

SAMPLES:

 $026S000104,\ 026S000104MS,\ 026S000104MD,\ 026S000108,\ 026S000118,\ 026S000204,$

026S000208, 026S000218, 026S000304, 026S000308, 026S000318, 026S000404,

026S000408, 026S000415

TOTAL METALS

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

The following blank result represents the highest detection associated with the samples and was used for data qualification:

Blank			Action Level
Type/ID#	Analyte	Max. Conc.	mg/kg
CCB2	arsenic	3.80 ug/L	3.80

CCB = Continuing Calibration Blank

All results greater than the IDL but less than 5X the blank amount (Action Level, mg/kg for soil samples) for which the contaminated blank was an associated calibration blank were flagged as undetected (U).

The following analytes had negative results with absolute values greater than the IDL's:

<u>Blank</u>			
Type/ID#	<u>Analyte</u>	Neg. Conc.	5X Conc. (mg/kg)
CCB4	cadmium	-4.30 ug/L	4.30
CCB2	zinc	-6.20 ug/L	6.20

CCB = Continuing Calibration Blank

All associated positive sample results less than 5X the absolute value of the negative blank results were flagged as estimated (UJ).

IV.) ICP Interference Check Sample Results:

All Interference Check Sample criteria were met. No action was required.

V.) ICP Serial Dilution Analysis:

All Serial Dilution criteria were met, so no action was necessary.

VI.) Laboratory Control Samples (LCS):

All Laboratory Control Sample criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

The Relative Percent Difference (RPD) of nickel (54.9%) exceeded the 35% QC limits for soil duplicate sample 026S000104MD. The results for this analyte in the samples of this SDG, which consisted entirely of positive detections, were flagged as estimated (J).

VIII.) Matrix Spike Recoveries:

The Percent Recovery (%R) of arsenic (70.4%) was below the 75-125% QC limit for sample 026S000104MS. The positive and non-detect results for this analyte in the samples of this SDG were flagged as estimated (J) and (UJ).

IX.) Field Duplicates:

There were no field duplicate samples associated with this SDG. No action was required.

X.) Furnace Atomic Absorption QC:

Method of Standard Additions (MSA):

The MSA coefficient of correlation was less than 0.995 for arsenic in the following samples:

Client	Coeffecient of
Sample #:	Correlation:
026S000104	0.968
026S000204	0.986
026S000208	0.949
026S000304	0.935
026S000308	0.944

All positive and non-detect results for arsenic in these samples were previously flagged as estimated (J) and (UJ) based on blank contamination or low matrix spike recoveries. No further action was necessary.

Post Digestion Spike Recoveries:

All Post Digestion Spike Recovery criteria were met. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met, so no action was taken.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualification.

E/A&H VALIDATION SUMMARY REPORT

Site Name:

NSA Memphis, Millington, Tennessee

CTO and Subtask No.:

0094-04730 NET, Bedford

Laboratory: Sample Delivery Group:

1719

Matrix:

Soil

SDG 1719 Sample ID and Analyses

Sample ID	Sample ID Appendix 9 Metals		Pest/PCBs
026S000501	Х	x	X

VALIDATION RESULTS

All samples were received by the laboratory intact and with the proper documentation on March 7, 1996, for metals, SVOCs, and pest/PCBs. The following sections summarize the data validation results.

Appendix IX Metals Fraction

- All holding times, initial calibration verifications, continuing calibration verifications, ICP interference check sample recoveries, LCSs, ICP serial dilution differences, and graphite furnace atomic absorption (GFAA) analytical spike results were acceptable. No problems were encountered during review of sample result verification.
- 2. The following elements were detected in the various blanks analyzed with this SDG.

Blank Detections and Associated Samples

Blank ID	Element	Conc.	Action Level	Associated Samples
ССВІ	Chromium Vanadium Tin	5.0 μg/L 4.1 μg/L 49.6 μg/L	5.0 mg/kg 4.1 mg/kg 49.6 mg/kg	0268000501
CCB2	Cadmium Vanadium Zinc Tin	3.6 μg/L -7.2 μg/L 8.7 μg/L 62.7 μg/L	3.6 mg/kg 14.4 mg/kg 8.7 mg/kg 62.7 mg/kg	026S000501
CCB3 (2nd run)	Selenium	2.5 μg/L	2.5 mg/kg	0268000501
CCB4 (2nd run)	Selenium	1.9 μg/L	1.9 mg/kg	026S000501

Blank Detections and Associated Samples

Blank ID	Element	Conc.	Action Level	Associated Samples
Method Blank	Barium Chromium Copper Lead Silver Vanadium Zinc	0.584 mg/kg -1.694 mg/kg 1.280 mg/kg 0.570 mg/kg -0.826 mg/kg -2.030 mg/kg -1.262 mg/kg	2.92 mg/kg 16.94 mg/kg 6.4 mg/kg 2.85 mg/kg 8.26 mg/kg 20.3 mg/kg 12.6 mg/kg	026S000501

Note: $\mu g/L = \text{micrograms per liter}$ mg/kg = milligrams per kilogram When the blank concentration was greater than the PQL, the AL was five times the blank concentration. Positive results less than the AL were qualified as nondetect (U); nondetect results were accepted without qualification.

When the blank concentration was less than the PQL (negative result), the AL was 10 times the absolute value of the concentration. Positive results less than the AL were qualified as estimated (J) and nondetect results were qualified as estimated (UJ).

3. The following elements exceeded the 75% to 125% control limits for the MS.

Matrix Spike Deficiencies

Element	%R	Associated Samples
Antimony	0.0	https://www.commonstate.com/commonstate/commonstate/commonstate/commonstate/commonstate/commonstate/commonstate
Cadmium	71.6	026S000501

All antimony results were qualified as estimated (J) for positive results and unusable (UR) for undetected results. All cadmium results were qualified as estimated for positive results (J) and undetected results (UJ).

5. The RPDs for chromium (38.6) and copper (61.8) exceeded the 20% maximum control limits for laboratory duplicates. All positive results were qualified as estimated (J) while nondetect results were accepted without qualification.

SVOC Fraction

 All holding times, GC/MS instrument performance checks, initial calibrations, continuing calibrations, surrogates recoveries, internal standard performance, and blank results were acceptable. No problems were encountered during review of sample result verification.

Pesticide/PCB Fraction

- 1. All holding times, surrogate recoveries, blank spike/blank spike duplicate recoveries, blanks, and initial calibrations were acceptable. No problems were encountered during review of sample result verification.
- 2. The following compounds exceeded the 25% maximum control limits for the continuing calibration check:

Continuing Calibration Check Deficiencies

Compound	% Difference	Column	Associated Samples
4,4'-DDE	40.1	RXT15	0268000501
Aroclor-1260	27.3	RXT15	026S000501

All results were less than the PQL and therefore were qualified as estimated (UJ).

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05/20/96		NAS	NAS MEMPHIS, RFI, ASSEMBLY C Time: 15:2 SWMU 26					
APK9-HETAL	SAMPLE ID> ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> MATRIX> UNITS>	02698B0501 143764\$ 02688B0501 03/06/96 Soil						
CAS # Perameter		1719 VAL						
SB Antimony AS Arsenic BA Barium		7.3 UR 5.7 82.8						
BE Beryllium CD Cadmium		0.53 J 1.2 UJ						
CR Chromium CO Cobalt CU Copper		15.2 J 8.5 J 15.6 U						
PB Lead HG Mercury NI Nickel		19.5 0.12 U 21.8						
SE Selenium AG Silver TL Thallium		0,34 U 1.6 J 0.49 U						
V Vanadium ZN Zinc SN Tin		25. 65.1 28.3 U						
		·						

NSA MEMPHIS NAS MEMPHIS, RFI, ASSEMBLY C SWMU 26

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Time: 15:23

RCRA PETAL	SAMPLE ID> ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> MATRIX> UNITS>	0268000104 4-1245908 0268000104 06/05/95 Soil	•	02650 4-124	591\$ 00108 /95	3	026-S- 026S00 4-1245 026S00 06/05/ Soil MG/KG	92\$ 0118	1	026-S-000 026S00020 4-124593S 026S00020 06/05/95 Soil MG/KG	4	026-5-1 0268001 4-1245 0268001 06/05/ Soil MG/KG	94\$ 0208	026-s-0 0268000 4-12459 0268000 06/05/9 Soil MG/KG	1218 155 1218	
CAS # Parameter		1439	YAL	1439		VAL	1439		VAL	1439	VAL	1439	VAL	1439		VAL
AS Arsenic CD Cadmium PB Lead HG Mercury NI Nickel ZN Zinc		3.6 0.75 6.3 0.13 11.8 29.2	n n		5.1 0.76 7.6 0.12 15.9 32.3	n n		2. 0.73 5. 0.12 13.5 17.7		7.	79 UJ 8 13 U		3.8 J 1. J 6.1 0.12 U 16.8 J 31.6		2.9 0.72 5.8 0.12 14.5 15.1	
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NSA MEMPHIS NAS MEMPHIS, RFI, ASSEMBLY C SWMU 26

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	SWMU 26								
RCRA PETAL	SAMPLE ID> ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> MATRIX> UNITS>	026\$000304 4-124596\$ 026\$000304 06/05/95	026-\$-0003-08 026\$000308 4-124597\$ 026\$000308 06/05/95 \$011 MG/KG	026-\$-0003-18 026\$000318 4-124598\$ 026\$000318 06/05/95 \$oil MG/KG	026-S-0004-04 026S000404 4-124599S 026S000404 06/05/95 Soil MG/KG	026-\$-0004-08 026\$000408 4-124600\$ 026\$000408 06/05/95 \$oil HG/KG	026-s-0004-15 026s000415 4-124601s 026s000415 06/05/95 soil MG/KG		
CAS # Parameter		1439 VAL	1439 VAL	1439 VAL	1439 VAL	1439 VAL	1439 VAL		
AS Arsenic CD Cadmium PB Lead HG Hercury NI Nickel ZN Zinc		6.6 J 0.97 J 5.9 0.12 U 18.5 J 34.7	0.49 UJ 0.96 J 7.4 0.12 U 15.8 J 29.	1.1 UJ 0.77 J 7.1 0.12 U 11.1 J 18.	3.9 J 0.78 J 0.49 U 0.12 U 19.9 J 30.1	7.3 J 1.2 J 5.2 0.12 U 16.4 J 23.8	1.7 UJ 0.68 UJ 6.5 0.12 U 11.4 J 21.		

NSA MEMPHIS NAS MEMPHIS, RFI, ASSEMBLY C SWMU 26

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			SWMU 2	26		
SUBA6-PEST	SAMPLE ID> ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> DATE EXTRACTED> MATRIX> UNITS>	026\$\$B0501 143764 026\$\$B0501 03/06/96 03/11/96 03/15/96 \$oil				
CAS # Pa	srameter	1719 VAL				
319-84-6 at 319-85-7 be 319-86-8 de 72-54-8 4, 72-55-9 4, 50-57-1 Di 959-98-8 Er 73213-65-9 Er 7421-93-4 Er 76-44-8 1024-57-3 He 72-43-5 Me 8001-35-2 To 1104-28-2 Ar 11141-16-5 Ar 153469-21-9 Ar 11096-82-5 Ar 153494-70-5 Er 5103-71-9 at 5103-74-2 ge 51	amma-BHC (Lindane) Lpha-BHC elta-BHC elta-BHC elta-BHC 4'-DDD 4'-DDE 4'-DDT ieldrin ndosulfan II ndosulfan sulfate ndrin aldehyde eptachlor e	2. U 2. U 2. U 2. U 2. U 2. U 4.1 U 41. U				

NSA MEMPHIS NAS MEMPHIS, RFI, ASSEMBLY C SWMU 26

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			SWMU	20			
SUB46-SVOA	SAMPLE ID> ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> DATE EXTRACTED> MATRIX> UNITS>	026-s-0005-01 026ss80501 143764 026ssb0501 03/06/96 03/11/96 03/12/96 Soil ug/Kg					
CAS #	Parameter	1719 VAL					
108-95-2	Phenol	430. U					
	bis(2-Chloroethyl)ether	430. U					
	2-Chlorophenol	430. U	·		• ***********		
555555000000000000000000000000000000000	1,3-Dichlorobenzene	430. U					
	1,4-Dichlorobenzene	430. U					
	1,2-Dichtorobenzene	430. U					
	2-Methylphenol (o-Cresol)	430. U					
	2,21-oxybis(1-Chloropropane)	430. U	1	l			
	4-Methylphenol (p-Cresol)	430. U					
	N-Nitroso-di-n-propylamine	430. U					
	Hexach Loroethane	430. U					
augustron areasonadautoroaksa	Ni trobenzene	430. U	1				
	Isophorone	430. U					
	2-Nitrophenol	430. U					
	2,4-Dimethylphenol	430. U					
	2.4-Dichlorophenol	430. U					
	1,2,4-Trichlorobenzene	430. U	I and a second control to the second in the				
	Naphthal ene	430. U					
	4-Chloroaniline	430. U					
87-68-3	Hexach Lorobutadiene	430. U					
111-91-1	bis(2-Chloroethoxy)methane	430. U		l	.		
	4-Chloro-3-methylphenol	430. U					
91-57-6	2-Methylnaphthalene	430. U				95000000000000000000000000000000000000	
77-47-4	Hexachlorocyclopentadiene	430. U					
88-06-2	2,4,6-Trichlorophenol	430. U	I				\$1000000000
95-95-4	2,4,5-Trichlorophenol	1100. U					
	2-Chloronaphthalene	430. U				A ANGO ANGO	
88-74-4	2-Nitroaniline	1100. U					
131-11-3	Dimethyl phthalate	430. U					
	Acenaphthylene	430. U					
	2,6-Dinitrotoluene	430. U				Q 4660 (1090 600 600 000 11.11 / 11.00 000 000 000 000 000 000 000 000 0	
	3-Nitroaniline	1100. U					
	Acenaph thene	430. U			**************************************	0.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000	
	2,4-Dinitrophenol	1100. U					
	4-Nitrophenol	1100. U			a conservation of the cons	50000000000000000000000000000000000000	d ocupus tayun jur juran dagamas ocup vurka kataka sa
NE NAME ANNA PARAMETERS OF THE STATE OF THE	Dibenzofuran	430. U	1		1		

NSA MEMPHIS NAS MEMPHIS, RFI, ASSEMBLY C SWMU 26

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SUB46-SVOA	SAMPLE ID> ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> DATE EXTRACTED> DATE AMALYZED> MATRIX> UNITS>	026-S-0005-01 026SSB0501 143764 026ssb0501 03/06/96 03/11/96 03/12/96 Soil ug/Kg			
CAS # Parameter		1719 VAL			
121-14-2 2,4-Dinitrotolu 84-66-2 Diethylphthalat 7005-72-3 4-Chlorophenylp 86-73-7 Fluorene 100-01-6 4-Nitrosodipher 101-55-3 4-Bromophenylp 118-74-1 Hexachloropher 85-01-8 Pentachloropher 85-01-8 Pentachloropher 85-01-8 Pentachloropher 85-01-8 Pentachloropher 85-01-8 Pintoropher 85-01-8 Pentachloropher 85-01-8 Pentachloropher 85-01-8 Pentachloropher 85-01-8 Pentachloropher 85-74-8 Carbazole 84-74-2 Di-n-butylphtha 129-00-0 Pyrene 85-68-7 Butylbenzylphth 91-94-1 3,31-Dichlorobe 56-55-3 Benzo(a)anthrac 117-81-7 Di-n-octyl phth 205-99-2 Benzo(b)fluorer 50-32-8 Benzo(a)pyrene 193-39-5 Indeno(1,2,3-cc 53-70-3 Dibenz(a,h)anth 191-24-2 Benzo(g,h,1)per	chenylether chenylether chenylether chenylether chenylether chene chenylether chene chenylether chene chenylether chene chenylether chene	430. U 430. U 430. U 430. U 1100. U 1100. U 1100. U 430. U 430. U 1100. U 120. J 430. U 510. J 61. J			

SWMU 27

DATA QUALIFICATION SUMMARY

NET, Inc. - 1441 Inorganics

SAMPLES: 027S000101, 027S000101MS, 027S000101MD, 027S000105, 027S000114, 027S000201,

027S000206, 027S000212

TOTAL METALS

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

Blank			Action Level
Type/ID#	<u>Analyte</u>	Max. Conc.	mg/kg
PBS2	antimony	11.3 ug/L	11.3
CCB2	cobalt	4.70 ug/L	4.70
CCB2	copper	5.10 ug/L	5.10
CCB3	silver	4.30 ug/L	4.30

CCB = Continuing Calibration Blank, PBS = Preparation Blank (Soil)

All results greater than the IDL but less than 5X the blank amount (Action Level, mg/kg for soil samples) for which the contaminated blank was an associated calibration or preparation blank were flagged as undetected (U).

The following analytes had negative results with absolute values greater than the IDL's:

Blank			
Type/ID#	<u>Analyte</u>	Neg. Conc.	5X Conc. (mg/kg)
PBS1	cadmium	-0.82 ug/L	0.82
CCB2	thallium	-3.60 ug/L	3.60
CCB2	zinc	-6.90 ug/L	6.90

CCB = Continuing Calibration Blank, PBS = Preparation Blank (Soil)

All associated positive sample results less than 5X the absolute value of the negative blank result were flagged as estimated (J) and all non-detects were flagged as estimated (UJ).

IV.) ICP Interference Check Sample Results:

All Interference Check Sample criteria were met. No action was required.

V.) ICP Serial Dilution Analysis:

All Serial Dilution criteria were met, so no action was necessary.

VI.) Laboratory Control Samples (LCS):

All Laboratory Control Sample criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

All Duplicate Sample criteria were met. No action was necessary.

VIII.) Matrix Spike Recoveries:

The Percent Recoveries (%R's) of the following analytes were below the 75-125% QC limits for spiked sample 027S000101MS:

Analyte	<u>%</u> R
antimony	8.70%
arsenic	61.3%
barium	61.5%
beryllium	64.1%
cadmium	61.5%
chromium	66.2%
cobalt	67.1%
copper	66.4%
nickel	68.5%
silver	65.0%
vanadium	39.3%
tin	68.2%

All non-detect results for antimony in the samples of this SDG were rejected (R) since the %R for this analyte was less than 30%. All positive results for antimony were flagged as estimated (J). All positive and non-detect results for the other analytes in the samples of this SDG were flagged as estimated (J) and (UJ).

IX.) Field Duplicates:

There were no field duplicate samples associated with this SDG. No action was required.

X.) Furnace Atomic Absorption QC:

Method of Standard Additions (MSA):

The MSA coefficient of correlation for arsenic in sample 027S000206 was 0.987, which was less than 0.995. The positive result for arsenic in this sample was previously flagged as estimated (J). No further action was necessary.

Post Digestion Spike Recoveries:

All Post Digestion Spike Recovery criteria were met. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met, so no action was taken.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria met, so no action was taken.

XIII.) Overall Assessment of Data/General:

The non-detect results for antimony were rejected in two samples due to matrix spike recoveries of less than 30%. All remaining laboratory data were acceptable with qualification.

DATA QUALIFICATION SUMMARY

NET, Inc. - 1447 Organics and Inorganics

SAMPLES: 027C000812, 027S000812, 027S000812MS, 027S000812MD, 027S000901, 027S000906,

027S000912, 027H000944, TRIP BLANK

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met. No action was necessary.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) for acetone (39.0%) exceeded the 30% QC limit for the standards run on 6/07/95 on instrument HO5970L. There was no positive result for this compound in the associated sample, so no action was necessary.

Continuing Calibration:

The Percent Difference (%D) of methylene chloride (26.7%) exceeded the 25% QC limit for the continuing calibration run on 6/13/95 at 10:43 on instrument HP5970K. The non-detect result for this compound in associated sample 027H000944 was flagged as estimated (UJ).

The Percent Differences (%D's) of methylene chloride (26.6%) and carbon tetrachloride (26.1%) exceeded the 25% QC limit for the continuing calibration run on 6/14/95 at 10:16 on instrument HP5970K. The associated sample for this calibration was the trip blank. No action was required.

The Percent Difference (%D) of 1,2-dichloroethene (46.0%) exceeded the 25% QC limit for the continuing calibration run on 6/12/95 at 10:48 on instrument HP5970L. The non-detect result for this compound in associated sample 027C000812 was flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

Methylene chloride was detected at 2.0 ug/L in water method blank VBLK061395K. The positive result for this compound in associated sample 027H000944, which was less than 10X the blank amount, was flagged as undetected (U) with the laboratory result being replaced by the CRQL.

Methylene chloride was detected at 1.0 ug/L in water blank VBLK061495K. The associated sample for this blank was a trip blank. No action was required.

Trip Blank:

Methylene chloride was detected at 4.0 ug/L in the trip blank associated with this SDG. The positive result for this compound in associated sample 027C000812, which was less than 10X the blank amount, was flagged as undetected with the detection limit replacing the analytical result. The result for this compound in the other associated sample (027H000944) was previously flagged based on the associated method blank. No further action was necessary.

TIC's:

There were no TIC's reported in the method blanks or trip blank for this SDG.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

No MS / MSD analysis was requested for this fraction of this SDG. No action was required.

VII.) Field Duplicates:

The field duplicate samples for samples 027C000812 and 027H000944 were not analyzed in this SDG. No action was required.

VIII.) Internal Standards Performance:

All Internal Standards Performance criteria were met. No action was required.

IX) TCL Compound Identification:

All TCL criteria were met, so no action was necessary.

X) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met. No action was required.

XI.) Tentatively Identified Compounds (TIC's):

All TIC criteria were met, so no action was taken.

XII.) System Performance:

All criteria were met, so no action was necessary.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualification.

TOTAL METALS

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank</u>		•	Action Level
Type/ID#	Analyte	Max. Conc.	mg/kg
CCB3	zinc	12.8 ug/L	12.8
CCB3	tin	23.1 ug/L	23.1

CCB = Continuing Calibration Blank

All results greater than the IDL but less than 5X the blank amount (Action Level, mg/kg for soil samples) for which the contaminated blank was an associated calibration blank were flagged as undetected (U).

The following analytes had negative results with absolute values greater than the IDL's:

<u>Blank</u>			
Type/ID#	<u>Analyte</u>	Neg. Conc.	5X Conc. (mg/kg)
CCB2	cadmium	-4.20 ug/L	4.20
CCB2	chromium	-6.80 ug/L	6.80
CCB7	thallium	-3.20 ug/L	3.20

CCB = Continuing Calibration Blank

All associated positive sample results less than 5X the absolute value of the negative blank result were flagged as estimated (J) and all non-detects were flagged as estimated (UJ).

IV.) ICP Interference Check Sample Results:

All Interference Check Sample criteria were met. No action was required.

V.) ICP Serial Dilution Analysis:

All Serial Dilution criteria were met, so no action was necessary.

VI.) Laboratory Control Samples (LCS):

All Laboratory Control Sample criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

All Duplicate Sample criteria were met. No action was necessary.

VIII.) Matrix Spike Recoveries:

The Percent Recoveries (%R's) of the following analytes were below the 75-125% QC limits for spiked sample 027S000812MS:

<u>Analyte</u>	%R.
antimony	42.5%
selenium	61.7%
thallium	71.6%

All positive and non-detect results for these analytes in the samples of this SDG were flagged as estimated (J) and (UJ).

IX.) Field Duplicates:

The calculable Relative Percent Differences (RPD's) of analytes in field duplicate samples 027S000812 and 027C000812 were:

Analyte	RPD
arsenic	16%
barium	13%
cadmium	27%
chromium	18%
cobalt	1.6%
copper	3.8%
lead	32%
nickel	22%
vanadium	5.4%
zinc	6.8%

All RPD's for these analytes were within the 60% QC limit for soil samples, so no action was necessary.

X.) Furnace Atomic Absorption QC:

Method of Standard Additions (MSA):

All MSA criteria were met. No action was required.

Post Digestion Spike Recoveries:

All Post Digestion Spike Recovery criteria were met. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met, so no action was taken.

XII) Quarterly Verification of Instrumental Parameters:

All criteria met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualification.



Chemical Services, Inc.

P. O. Box 930422. Norcross. Ga. 30093

DATA VALIDATION SUMMARY REPORT

COMPANY:

Ensafe/Allen & Hoshall

SITE NAME:

NAS Memphis

PROJECT NUMBER:

8500.024

CONTRACTED LAB:

National Environmental Testing, Inc.

QA/QC LEVEL:

Level III

EPA SOW/METHOD:

EPA 1990 SOW -

VALIDATION GUIDELINES:

USEPA Contract Laboratory Program National Functional

Guidelines for Organic Data Review, 1994; USEPA Contract Laboratory Program National Functional Guidelines for Inorganic

Data Review, 1994

SAMPLE MATRICES:

Soil and Water

TYPES OF ANALYSES:

Volatile Organics (VOA), Total Metals (Metals)

SDG NUMBER:

1446

SAMPLES:

<u>Client</u>	<u>Lab</u>			
Sample #:	Sample #:	Matrix	<u>VOA</u>	<u>Metals</u>
027S000301	124859	Soil		X
027S000306	124860	Soil		X
027S000312	124861	Soil		X
027S000401	124862	Soil		X
027S000406	124863	Soil		X
027S000412	124864	Soil		X
027S000501	124865	Soil		X
027S000506	124866	Soil		X
027S000512	124867	Soil		X
027C000512	124857	Soil	X	X
027C000512RE	124857RE	Soil	X	
027S000601	124868	Soil		X
027S000606	124869	Soil		X
027S000612	124870	Soil		X
027S000701	124871	Soil		X
027S000706	124872	Soil		X
027S000712	124873	Soil		X
027S000801	124874	Soil		X

<u>Metals</u>
X
X
· · X
X

 $\mathrm{C}=\mathrm{FIELD}$ DUPLICATE, $\mathrm{H}=\mathrm{FIELD}$ DUPLICATE, $\mathrm{RE}=\mathrm{REANALYSIS},$ $\mathrm{MS}=\mathrm{MATRIX}$ SPIKE, $\mathrm{MD}=\mathrm{MATRIX}$ DUPLICATE

DATA REVIEWER(S):

Amy L. Hogan, Marvin L. Smith

RELEASE SIGNATURE:

Data Qualifier Definitions:

- J The associated numerical value is an estimated quantity.
- R The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U The compound/analyte was analyzed for, but not detected.
 The associated numerical value is the sample quantitation limit.
- UJ The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

NET, Inc. - 1446 Organics & Inorganics

SAMPLES: 027S000301, 027S000306, 027S000312, 027S000401, 027S000406, 027S000412,

027S000501, 027S000506, 027S000512, 027S000512MS, 027S000512MD,

027C000512, 027C000512RE, 027H000545, 027S000601, 027S000606, 027S000612, 027S000701, 027S000706, 027S000712, 027S000801, 027S000806, 027C000806,

027C000806RE

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met. No action was necessary.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) for acetone (39.0%) exceeded the 30% QC limit for the standards run on 6/07/95 on instrument HO5970L. The positive result for acetone in sample 027H000545 was flagged as estimated (J).

Continuing Calibration:

The Percent Differences (%D's) of methylene chloride (26.6%) and carbon tetrachloride (26.1%) exceeded the 25% QC limit for the continuing calibration run on 6/14/95 at 10:16 on instrument HP5970K. The non-detect results for these two compounds in sample 027H000545 were flagged as estimated (UJ).

The Percent Difference (%D) of 2-hexanone (25.9%) exceeded the 25% QC limit for the continuing calibration run on 6/13/95 at 09:53 on instrument HP5970L. The non-detect results for this compound in associated samples 027C000512RE and 027C000806 were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

Methylene chloride was detected at 2.0 ug/L in soil method blank VBLK061395L. The positive results for this compound in associated samples 027C000806 and 027C000512RE, which were less than 10X the blank amount, were flagged as undetected (U) with the laboratory results less than the CRQL being raised to the CRQL.

Methylene chloride was detected at 1.0 ug/L in water blank VBLK061495K. The positive result for this compound in associated sample 027H000545, which was less than 10X the blank amount, was flagged as non-detected with the laboratory results less than the CRQL being raised to the CRQL.

Trip Blank:

There were no trip blanks associated with this SDG. No action was necessary.

TICs:

There were no TIC's reported in the method blanks for this SDG.

V.) Surrogate Recoveries:

The Percent Recoveries (%R's) of DCE exceeded the 70-121% QC limits in samples 027C000806 (122%) and 027C000806RE (123%). The positive result for methylene chloride in sample 027C000806RE was flagged as estimated (J). No further action was required.

VI.) Matrix Spike/Matrix Spike Duplicate (MS / MSD):

MS / MSD analysis was not performed in this fraction. No action was taken.

VII.) Field Duplicates:

There were no field duplicate samples for this fraction. No action was necessary.

VIII.) Internal Standards Performance:

The Percent Recoveries (%R's) of 1,4-difluorobenzene (41%) and chlorobenzene-d5 (40%) in sample 027C000512 were below the 50-200% QC limits. All positive and non-detect results for the associated compounds in this sample were flagged as estimated (J) and (UJ).

The Percent Recoveries (%R's) of bromochloromethane (48%), 1,4-difluorobenzene (37%) and chlorobenzene-d5 (35%) in sample 027C000512RE were below the 50-200% QC limits. All associated sample results for these compounds, which consisted entirely of non-detects, were flagged as estimated (UJ).

The Percent Recoveries (%R's) of bromochlorobenzene (40%), 1,4-difluorobenzene (30%) and chlorobenzene-d5 (27%) in sample 027C000806 were below the 50-200% QC limits. All associated

sample results for these compounds, which consisted entirely of non-detects, were flagged as estimated (UJ).

The Percent Recoveries (%R's) of bromochlorobenzene (42%), 1,4-difluorobenzene (36%) and chlorobenzene-d5 (32%) in sample 027C000806RE were below the 50-200% QC limits. The associated positive and non-detect sample results for these compounds were flagged as estimated (J) and (UJ).

IX.) TCL Compound Identification:

All TCL criteria were met, so no action was necessary.

X) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met. No action was required.

XI.) Tentatively Identified Compounds (TICs):

All TIC criteria were met, so no action was taken.

XII.) System Performance:

All criteria were met, so no action was necessary.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualification. The original sample 027C000512, having fewer qualification flags than the reextraction, was considered by the validator to be of preferable data quality. The original sample 027C000806 was considered by the validator to be of preferable data quality as compared to the reextraction due to shorter holding times.

TOTAL METALS

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

Blank			Action Level
Type/ID#	Analyte	Max. Conc.	mg/kg
CCB2	arsenic	3.80 ug/L	3.80
CCB4	cobalt	3.20 ug/L	3.20
PBS	selenium	0.55 mg/kg	2.75
CCB1	tin	20.2 ug/L	20.2

CCB = Continuing Calibration Blank, PBS = Preparation Blank Soil

All results greater than the IDL but less than 5X the blank amount (Action Level mg/kg for soil samples) for which the contaminated blank was an associated calibration or laboratory preparation blank were flagged as undetected (U).

The following analytes had negative results with absolute values greater than the IDL's:

<u>Blank</u>			
Type/ID#	<u>Analyte</u>	Neg. Conc.	5X Conc.
PBS	silver	-1.16 mg/kg	5.80 mg/kg
CCB7	thallium	-3.20 ug/L	3.20 mg/kg
CCB3	zinc	-13.7 ug/L	13.7 mg/kg

CCB = Continuing Calibration Blank, PBS = Preparation Blank Soil

All associated positive sample results less than 5X the absolute value of the negative blank result were flagged as estimated (J) and all non-detects were flagged as estimated (UJ).

IV.) ICP Interference Check Sample Results:

All Interference Check Sample criteria were met. No action was required.

V.) ICP Serial Dilution Analysis:

All Serial Dilution criteria were met, so no action was necessary.

VI.) Laboratory Control Samples (LCS):

All Laboratory Control Sample criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

All Duplicate Sample criteria were met. No action was necessary.

VIII.) Matrix Spike Recoveries:

The Percent Recoveries (%R's) of the following analytes were below the 75-125% QC limits for sample 027S000512MS:

Analyte	% R
antimony	31.2%
selenium	22.9%
silver	16.9%
thallium	70.2%

All positive and non-detect results for antimony and thallium were flagged as estimated (J) and (UJ). Due to excessively low %R's (<30%) all positive detections of selenium and silver were flagged as estimated (J) and all non-detects were rejected (R).

IX.) Field Duplicates:

The Relative Percent Differences (RPD's) for the following analytes were calculated for field duplicate samples 027S000512 and 027C000512:

<u>Analyte</u>	RPD
arsenic	41%
barium	13%
beryllium	35%
chromium	14%
cobalt	34%
copper	12%
lead	42%
nickel	11%
selenium	43%
vanadium	36%
zinc	21%

All RPD's for these analytes were within the 60% QC limit for soil samples, so no action was taken.

The Relative Percent Differences (RPD's) for the following analytes were calculated for field duplicate samples 027S000806 and 027C000806:

<u>Analyte</u>	RPD
arsenic	57%
barium	20%
beryllium	15%
chromium	14%
cobalt	28%
copper	23%
lead	35%
nickel	17%
vanadium	0.6%
zinc	67%

The RPD for zinc exceeded the 60% QC limit for soil samples, so the results for zinc in these two samples were flagged as estimated (J). The RPD's for the other analytes were within the QC limits. No further action was required.

X) Furnace Atomic Absorption QC:

Method of Standard Additions (MSA):

All MSA criteria were met. No action was required.

Post Digestion Spike Recoveries:

All Post Digestion Spike Recovery criteria were met. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met, so no action was taken.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All non-detect results for selenium and silver were rejected due to low (<30%) percent recoveries in the matrix spike sample. All remaining laboratory data were acceptable with qualification.

E/A&H VALIDATION SUMMARY REPORT

Site Name:

NSA Memphis, Millington, Tennessee

CTO and Subtask No.:

0094-04730

Laboratory:

NET, Bedford

Sample Delivery Group:

1717

Matrix:

Soil

SDG 1717 Sample IDs and Analyses

Sample ID	Appendix IX Metals	SVOCs	Pest/PCBs	
0278000101		X	x	
027S000201		X	X	
027S000501 X X				
027E030696*	X	X	X	

Note:

The "*" in the table above means the sample was a field or rinsate blank. Field and rinsate blanks were used to evaluate contamination in investigative samples. Therefore, results or qualifiers were not changed for these samples.

VALIDATION RESULTS

All samples were received by the laboratory intact and with the proper documentation on March 7, 1996, for metals, SVOCs, and pest/PCBs. The following sections summarize the data validation results.

Appendix IX Metals Fraction

1. Results in this SDG were for a rinsate blank only. Validation of the rinsate blank was not required. Any detections in the rinsate blank were assessed against associated samples in other SDGs.

SVOC Fraction

- 1. All holding times, GC/MS instrument performance checks, initial calibrations, continuing calibrations, surrogate recoveries, and internal standard performance were acceptable. No problems were encountered during review of sample result verification.
- 2. Di-n-butylphthalate was detected in one method blank and in rinsate blank 027E030696. The sample results were all less than the PQL; therefore, qualification of the data was not necessary.

Pesticide/PCB Fraction

1. All holding times, surrogate recoveries, blanks, and initial calibrations were

- acceptable. No problems were encountered during review of sample result verification.
- 2. The following compounds exceeded the 25% maximum control limits for the continuing calibration check:

Continuing Calibration Check Deficiencies

Compound	% Difference	Column	Associated Samples
4,4'-DDE	40.1	RXT15	027S000101 027S000201 027S000501
Aroclor-1260	27.3	RXT15	027S000101Dil 027S000201Dil
4,4'-DDE	46.2	RXT15	027S000101Dil 027S000201Dil
4,4'-DDE	34	RXT15	027S000501Dil

All results were less than the PQL and therefore were qualified as estimated (UJ).

3. Dieldrin in all three samples and alpha-Chlordane and gamma-Chlordane in sample 027S000201 exceed the calibration range. The values which exceeded the calibration range were substituted by diluted values.

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APX9-HETAL		SAMPLE ID> CRIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> MATRIX> LMITS>	027-S-0001-1 027S000101 1-124683S 027S000101 06/06/95 Soil MG/KG)1	027-\$-0001- 027\$000105 1-124684\$ 027\$000105 06/06/95 \$011 MG/KG) 5	027-s-0001-1/ 027s000114 1-124685s 027s000114 06/06/95 soil MG/KG	4	027-s-0002-0 027s000201 1-1246865 027s000201 06/06/95 soll MG/KG	1	027-s-0002-0 027s000206 1-124687s 027s000206 06/06/95 sail MG/KG	6	027-s-0002-1 0278000212 1-1246888 0278000212 06/06/95 \$011 MG/KG	12
CAS # Pa	rameter		1441	VAL	1441	VAL	1441	VAL	1441	VAL	1441	YAL	1441	VAL
Material Company of the Company of t	timony		19.1	J	20.4	J	12.8	UR	18.5	J	18.	J	12.8 .	000000000000000000000000000000000000000
	senic		33.	J	11.9	J	6.4	J	15.9	J	13.2	j	5.3	
BA Ba	#0.666666666000000000666000000		153.	J	160.	J	72.9	J	109.	J	191.	J	73.8	J
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ryllium 		1.2	J	0.42	J	0,34	J	0.97		0.54	J	0.33 1.3	
CD Ca	88668446688000,0000000000		1.3	J	2.6	J	2.2	J	0.7	IJ	2.4	j		J
CO CO	romium bole		9. 3.8	ni i	9,4	j j	6.4 7.4) j	5.5 4.5	n1 1	10.3 11.9	J	7.4 8.	j
cu co			13.5	j.	17.5	i	12.7	j	14.3	J	18.	i i	16.1	
PB Le	• • • • • • • • • • • • • • • • • • • •		40.4		12.6		**************************************		22.9		14.5	auti Messesses	10.7	
000000000000000000000000000000000000000	rcury		1.6		0.12	U	0.12	U	0.3		0.12	M 44	0.12	
NI Ni			5.5	UJ	20.8	J	15.1	J	5.9	UJ	26.3	J	16.5	J
,00000000000000000000000000000000000000	cket Lenium		0.48	60000000000000000000	0.52	AND AND ASSESSMENT OF STATE	0.51	ับ	0.47	Ü	0.51		0.51	0.00.00.00.00.00.00.00.00.00.00.00.00.0
AG Si			6.6	J	0.77		0.77	UJ	2.3	UJ	0.77	UJ	0.77	
6606960606444696666666666666	altium			บม	0.52		0.51	เม	0.47		0.51			UJ
	nadium		9.7	J	19.9	J	14.6	J	12.7	J	22.5	J	15.6	J
ZN Zi			178.		54.2		39.9	•	69.7	•	60.8		51.1	
SN Ti			12.1	J	3.9	UJ	5.5	J	5.5	J	4.4	J	3.8	UJ

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APX9-RETAL 027-S-0003-06 027-s-0003-12 027-5-0004-01 027-5-0004-06 027-5-0004-12 SAMPLE ID ----> 027-5-0003-01 0278000401 ORIGINAL ID ----> 0278000301 0278000306 0275000312 0278000406 0275000412 8-124860s 8-1248635 8-1248645 8-1248598 8-1248615 8-1248625 LAB SAMPLE ID ---> 0278000306 0278000301 0275000312 0275000401 0275000406 0275000412 ID FROM REPORT --> SAMPLE DATE ----> 06/08/95 06/08/95 06/08/95 06/08/95 06/08/95 06/08/95 MATRIX ----> Soil Soil Soil Soil Sail Soil MG/KG MG/KG MG/KG MG/KG MG/KG UNITS ----> MG/KG CAS # Parameter 1446 VAL 1446 VAL 1446 1446 1446 1446 VAL VAL VAL VAL SB Antimony 11.8 UJ 12.3 IJ 12.9 UJ 13.9 IJ 12.3 IJ 12.9 UJ AS Arsenic 4.9 6.3 10.6 3.5 10.3 10. BA Barium 111. 197. 131. 225. 163. 100. BE Beryllium 0.61 0.46 J 0.68 0.46 0.41 0.83 CD Cadmium 0.97 0.74 U 0.77 1.6 0.74 U 0.78 U CR Chromium 14.3 8.6 13.8 17. 11.6 10.8 CO Cobalt 3.2 11.7 7.2 5.8 J 10. 8.7 CU Copper 17.6 10. 12.4 38.4 11.7 12.9 40.9 7.7 PB Lead 11.9 60.5 11.6 11.7 HG Mercury 1.2 0.12 U 0.12 U 1.7 0.12 U 0.12 U NI Nickel 9.1 22.7 24. 28.1 20.1 11. SE Selenium 0.76 UR 0.7 UR 0.73 UR 0.71 UR 0.63 UR 0.75 UR AG Silver 1.2 UR 1.2 UR 1.3 UR 8.4 1.2 UR 1.3 UR Thallium 0.47 IJ 0.49 UJ IJ IJ 0.49 IJ 0.51 0.56 0.52 IJ Vanadium 11.1 20.8 24.6 17.7 18.8 17.3 ZN Zinc 155. 47.1 57. 239. 54.5 53.1 SN Tin 16.6 U 4.2 7.1 22.1 3.7 U U J U 6.8 U

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NPK9-HETAL	SAMPLE ID> ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> MATRIX> UNITS>	027-\$-0005- 027\$000501 8-124865\$ 027\$000501 06/08/95 Soil MG/KG	01	027-\$-0005-00 027\$000506 8-124866\$ 027\$000506 06/08/95 \$011 HG/KG	•	027-\$-0005-1: 027\$000512 8-124867\$ 027\$000512 06/08/95 \$011 MG/KG	2	027-C-0005-1; 027C000512 8-1248575 027C000512 06/08/95 \$011 MG/KG		027-S-0006-0 027S000601 8-124868S 027S000601 06/08/95 Soil MG/KG	1	027-\$-0006-0 027\$000606 8-124869\$ 027\$000606 06/08/95 \$oil MG/KG	6
CAS # Parameter		1446	VAL	1446	VAL	1446	VAL	1446	VAL	1446	VAL	1446	VAL
SB Antimony		12.1	υJ	12.3	UJ	12.5	υJ	12.4	UJ	12.8	Πĵ	12.1	ΩJ
AS Arsenic		9,4		5.6		5.1		7.7		7.7		8.9	
BA Barium		202.	C20020 3 03963666	121.	4100 4 00000000	115.	800012000000000000000000000000000000000	131.		120.	800 900 200 000 000	294.	888882863863
BE Beryllium CD Cadmium		0.45 0.82		0,34 0.74	J U	0.4 0.75	J U	0.57 0.75	j U	0.65 0.77	J	0.72	U
CR Chromium		11.2		9.9		15.		17.3		16.4		16.7	
CO Cobalt		8.	J	6.1	J	5.1	J	7.2	J	6.6	J	8.7	J
CU Copper		23.5	•	7.1		7.9		8.9		11.		13.1	
PB Lead		43.7	55-045-00-02-02-02-02-02-02-02-02-02-02-02-02-	7.		7.8		11.9	866663246974699	30.6	999999999999999	9.4	0.0000000000000000000000000000000000000
HG Mercury		0.75		0.12	u	0.12	11	0.12	11	0.25		0.11	Ú
NI Nickel		18.7	.cc-200000000000000000000000000000000000	14.9	*:::: ** ::::::::::::::::::::::::::::::	14.9	***********	16.6		14.9	000000000000000000000000000000000000000	33.1	>->
SE Selenium		0.58	UR	0.52	UR	1,1	UR	0.71	UR	0.86	떖	0.54	UR
AG Silver	udinada naga sanan sanah dalah sada dan sanah dalah dalah dalah dalah sa	2.3	7	1.2	UR	1.2	UR	1.2	UR	1.3	UR	1.2	UR
TL Thellium		0.48	U.I	0.49	UJ	0.5	UJ .	0.87	UJ	0.51	บง	0.48	UJ
V Vanadium		15.4	Santa S	14.4	CONTRACTOR OF THE	17.5	ASSEST STANDARDS	25.1		19.1	V-000000000	30.	r krysterrayannanas
ZN Zinc		138.		39.5		45.9		56.9		86.8		73.4	
SN Tin		11.3	U	4.8	U	3.7	U	3.7	ŭ	6.4	U	6.4	U

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APX9-METAL 027-5-0006-12 027-S-0007-01 027-S-0007-06 027-5-0007-12 027-5-0008-01 027-5-0008-06 SAMPLE ID ----> ORIGINAL ID ----> 0278000612 0275000701 0275000706 0278000712 0278000801 0275000806 8-124870s 8-1248715 8-1248725 8-1248735 8-1248745 8-1248755 LAB SAMPLE ID ---> 0275000701 0278000801 0275000612 0275000706 0275000712 0275000806 ID FROM REPORT --> SAMPLE DATE ----> 06/08/95 06/08/95 06/08/95 06/08/95 06/08/95 06/08/95 MATRIX -----> Soil Soit Soil Soil Soil Soil UNITS ----> MG/KG MG/KG MG/KG MG/KG MG/KG MG/KG CAS # Parameter 1446 1446 1446 1446 1446 1446 VAL VAL VAL VAL VAL VAL SB Antimony 12.6 UJ 10.7 UJ 12. LU 11.9 LU 11.3 บม 12.3 7. AS Arsenic 5.1 4. 8.7 10.6 14.2 BA Barium 110. 148. 167. 151. 110. 138. BE Beryllium 0.39 0.21 0.46 J 0.41 0.38 0.44 1 CD Cadmium 0.76 U 0.97 0.72 0.72 U 0.68 0.74 u CR Chromium 13.4 6.7 15. 13.5 12.8 10,2 CO Cobalt 4.2 1.3 u 7. 7.6 7.9 9.3 38.3 CU Copper 8.6 7.7 7.4 8.8 11.8 PB Lead 6.1 277. 7.8 10.6 24.7 14.5 HG Mercury 0.12 U 3.1 0.11 U 0.11 0.13 0.12 Nickel 21.8 14.4 5.3 u 19.6 19.4 14.8 SE Selenium 0.71 UR 0.48 0.48 0.45 UR 0.43 UR UR UR 0.49 AG Silver 1.3 UR 15.8 1.2 1.2 UR 1.1 UR 1.2 UR UR TL Thellium 0.43 0.48 UJ 0.5 UJ UJ IJ 0.48 0.45 IJ 0.49 IJ Vanadium 12.9 2.8 23.5 19.8 18.3 17.2 ZN Zinc 55.5 58.5 49.1 89.2 163. 45.4 SN Tin 3.8 19.9 U 4. Ш 6. U 4.1 7.7

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APX9-METAL SAMPLE ID -----> 027-C-0008-06 027-5-0008-12 027-C-0008-12 027-5-0009-01 027-5-0009-06 027-S-0009-12 ORIGINAL ID ----> 027000806 0275000812 0270000812 0278000901 0278000906 0278000912 LAB SAMPLE ID ---> 8-124858s 9-124878\$ 9-1248775 9-1248795 9-124880\$ 9-1248815 0275000912 027000806 0278000812 0270000812 0275000901 0278000906 ID FROM REPORT --> 06/08/95 06/08/95 06/08/95 06/08/95 SAMPLE DATE ----> 06/08/95 06/08/95 MATRIX -----> Soil Soil Soil Soil Sail Soil WITS -----> MG/KG MG/KG MG/KG MG/KG MG/KG MG/KG CAS # Perameter 1446 YAL 1447 VAL 1447 VAL 1447 VAL 1447 VAL 1447 VAL SB Antimony 12.1 UJ 12.5 IJ 12.6 IJ 12.3 UJ 12.8 13. LU 7.9 7.9 AS Arsenic 9.2 7.8 11.2 13.7 BA Barium 113. 77.8 68.6 52.7 60.1 134. BE Bervilium 0.38 0.3 0.3 0.33 0.47 0.28 Cadmium 0.73 0.78 u 0.99 1.3 1.1 1.9 UJ CR Chromium 11.7 9.7 4.9 6.7 8. 10. CO Cobalt 7. 6.5 6.4 5.4 7.1 5.7 CU Copper 9.4 12.9 13.4 11.3 18.1 13.2 9.6 9. Lead 9.4 6.8 10.2 13. 0.12 HG Mercury 0.12 0.12 0.12 U 0.12 U U 0.12 NI Nickel 18.3 23.2 18.5 10.2 26.6 17.5 0.5 SE Selenium 0.75 UR 0.53 0.51 UJ 0.51 IJ 0.53 AG Silver 1.2 0.83 0.74 0.76 0.97 UR 0.77 TL Thattium 0.49 0.51 UJ 0.5 0.48 IJ 0.5 IJ 0.51 IJ IJ V Vanadium 17.1 12.5 13.2 26.1 18.9 13.1 ZN Zinc 40. 42.8 59. 38. 44.6 31.6 SNITin 7.7 4.8 U 5.2 3.8 U 3.7 U 4.3 U U

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SAMPLE ID	05/20/96		NAS	SWMU	27	Time: 15:23
309-00-2 Aldrin 2.1	SUBA6-PEST	ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> DATE EXTRACTED> DATE AMALYZED> MATRIX>	027\$\$B1001 143759 027\$\$B1001 03/06/96 03/14/96 03/16/96 \$oil	027\$\$B1101 143760 027\$\$B1101 03/06/96 03/14/96 03/16/96 \$011	0275SB1201 143761 0275SB1201 03/06/96 03/14/96 03/18/96 Soil	
58-89-9 Somma-BIC (Lindene)	CAS #	Parameter	1717 VAL	1717 VAL	1717 VAL	
58-89-9 samma-BHC (Lindane) 319-84-6 alpha-BHC 2.1 U 2. U 2. U 2. U 3. 319-85-7 beta-BHC 2.1 U 2. U 2. U 2. U 3. 319-85-7 beta-BHC 319-85-7 beta-BHC 2.1 U 2. U 2. U 2. U 3. 319-85-8 delta-BHC 2.1 U 2. U 2. U 2. U 3. 319-85-8 delta-BHC 2.1 U 2. U 2. U 3. U 3. 319-85-8 delta-BHC 319-85-9 4,41-DDD 4.2 U 4. U 2.6 J 3. 319-85-9 delta-BHC 30-97-3 4,41-DDF 7.1 J 19. J 14. J 3. 319-9 delta-BHC 320-09-3 4,41-DDF 7.1 J 19. J 14. J 3. 3213-65-9 delta-BHC 33213-65-9 delta-BHC 33	309-00-2	Aldrin	2.1 U		2. U	
319-85-7 beta-BHC	58-89-9	gamma-BHC (Lindane)	2.1 U	2. U		
319-86-8 delta-BHC						
319-86-8 delta-BHC			2.1 U	2. U		
72-55-9 4,4'-DDE	319-86-8	delta-BHC	2.1 U	2. U		
72-55-9 4, 4'-DDE	72-54-8	4.41-DDD	4.2 U	4. U	2.6 J	
50-29-3 4,4'-DDT 7.1 J 19. J 14. J 60-57-1 Dieldrin 200. D 1200. D 710. D 99-98-8 Endosulfan I 2.1 U 2. U 2. U 3.3213-65-9 Endosulfan II 4.2 U 4. U 4.1 U 9.1031-07-8 Endosulfan sulfate 4.2 U 4. U 4.1 U 9.72-20-8 Endrin 4.2 U 8.1 J 4.5 7421-93-4 Endrin aldehyde 4.2 U 4. U 4.1 U 9.72-20-8 Endrin aldehyde 4.2 U 4. U 4.1 U 9.72-20-8 Heptachlor 2.1 U 2. U 2. U 2. U 9.72-20-8 Heptachlor 2.1 U 2. U 2. U 2. U 9.72-20-8 Heptachlor 90-00-00-00-00-00-00-00-00-00-00-00-00-0					the state of the s	
60-57-1 bieldrin 200. D 1200. D 710. D 710. D 759-98-8 Endosulfan I 2.1 U 2. U 4. U 4.1 U 759-98-8 Endosulfan II 4.2 U 4. U 4.1 U 759-98-8 Endosulfan sulfate 4.2 U 4. U 4.1 U 759-98-8 Endosulfan sulfate 4.2 U 4. U 4.1 U 759-98-8 Endrin 4.2 U 8.1 J 4.5 759-98-8 Endrin 4.2 U 8.1 J 4.5 759-98-8 Endrin 4.2 U 4. U 4.1 U 759-98-8 Endrin 4.2 U 4.0 U 4.1 U 759-98-98 Endrin 4.2 U 4.0 U 4.1 U 4.1 U 759-98-98 Endrin 4.2 U 4.0 U 4.1 U 4.1 U 759-98-98 Endrin 4.2 U 4.0 U 4.1 U 4.1 U 759-98-98 Endrin 4.2 U 4.0 U 4.1 U 4.1 U 759-98-98 Endrin 4.2 U 4.0 U 4.1 U	50-29-3	4,41-DDT	7.1 J	19. J	14. J	
SSP-98-8 Endosulfan I			Electric and the second	and committee and an annual co		
33213-65-9 Endosulfan II			The state of the s	AND CONTRACTOR OF THE PROPERTY		
1031-07-8 Endosulfan sulfate 4.2 U 4. U 4.1 U 7-2-20-8 Endrin 4.2 U 8.1 J 4.5 T 7-20-8 Endrin 1 4.2 U 8.1 J 4.5 T 7-20-8 Endrin 1 4.2 U 8.1 J 4.5 T 7-20-8 Endrin 1 4.2 U 4. U 4.1 U 4.1 U 7-2-2-20 Endrin 1 4.2 U 2. U 2. U 2. U 1 4. U 4.1 U 1 4.1 U		 Research of the second s	A			
72-20-8 Endrin 4.2 U 8.1 J 4.5 7421-93-4 Endrin aldehyde 4.2 U 4. U 4.1 U 76-44-8 Heptachlor 2.1 U 2. U 2. U 1024-57-3 Heptachlor epoxide 3.2 J 19. 6. J 72-43-5 Methoxychlor 21. U 20. U 20. U 8001-35-2 Toxaphene 42. U 40. U 41. U 1104-28-2 Aroclor-1016 42. U 40. U 41. U 1114-16-5 Aroclor-1221 42. U 40. U 41. U 1114-16-5 Aroclor-1232 42. U 40. U 41. U 12672-29-6 Aroclor-1242 42. U 40. U 41. U 11097-69-1 Aroclor-1254 42. U 40. U 41. U 11097-69-1 Aroclor-1260 42. U 40. U 41. U 53494-70-5 Endrin ketone 4.2. U 4. U 4. U	1031-07-8	Endosulfan sulfate		550 - 5505 5505 5505 5505 5505 5505 5505 55		
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1311-44- 1312-Chloroethyl)ethe	CAS #	Parameter	1717	VAL	1717	VAL	1717	VAL			
95-97-8 2-chtorophenol	108-95-2	Phenol			400.	U	410.	U			
541-73-1 3-9-01ch1orobenzene	111-44-4	bis(2-Chloroethyl)ether	420.	U	400.	U	410.	U			
100-64-7 1,4-0 ich lorobenzene	95-57-8	2-Chlorophenol	420.	U	400.	U	410.				
95-50-1 1,2-Dichlorobenzene			Control of the second section of the second		400.	Contract Secretarian		****			
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88-75-5			200000000000000000000000000000000000000		and the second second second			**************			
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CAS #	Parameter	1717	VAL	1717	VAL	1717	VAL			
121-14-2	2,4-Dinitrotoluene	420.	U	400.	U	410.	U			5 00.00.00.00.00.00.00.00.00.00.00.00.00.
84-66-2	Diethylphthalate	420.	U	400.	U	410.	U			
7005-72-3	4-Chlorophenylphenylether	420.	U	400.	U	410.	U	22000000000000000000000000000000000000		
86-73-7	Fluorene	420.	U	380.	J	410.	U			
	4-Nitroaniline	1000.	U	1000.	U	1000.	U			
	2-Methyl-4,6-Dinitrophenol	1000.	U	1000.	U	1000.	U			
	N-Nitrosodiphenylamine	420.	U	400.	U	410.	U		.	
	4-Bromophenyl-phenylether	420.	U	400.	U	410.	U			
	Hexach Lorobenzene	420.	U	400.	U	410.	U	vas an exercence of a continue acceptable		
87-86-5	Pentachlorophenol	1000.	U	1000.	U	1000.	U			
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	Anthracene	420.	U	640.		94.				
AND	Carbazole	420.	U	600.	53000000000000000	40.	J			
	Di-n-butylphthalate	420.	ป	400.	U	410.	U			
	Fluoranthene	79.	J	2900.		630.				
129-00-0		79.	J	2400.		560.				
	Butylbenzylphthalate	420.	U	400.	U	410.	U			
	3,31-Dichlorobenzidine	420.	IJ	400.	U	410.	U			
	Benzo(a)anthracene	41.	J	1400.	50000000000000000000000000000000000000	320.	J			
218-01-9		50.	J	1300.		310.	J			
	bis(2-Ethylhexyl)phthalate (BEHP)	420.	U	400.	U	410.	U	::::::::::::::::::::::::::::::::::::::		
	Di-n-octyl phthalate	420.	U	400.	u	410.	U			
	Benzo(b)fluoranthene	50.	J	1200.	160000000000000000000000000000000000000	330.	J	C 25 - 14 4 6 5 6 6 7 6 7 6 7 6 7 6 7 6 7 6 7 6 7 6	00.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000	
	Benzo(k)fluorenthene	50.	J	890.		280.	J			
	Benzo(a)pyrene	51.	J	1100.	5655868588888888	290.	J			
193-39-5	Indeno(1,2,3-cd)pyrene	420.	U	520.		140.	J			
53-70-3	Dibenz(a,h)anthracene	420.	U	230.	J	43.	J	va	***************************************	
191-24-2	Benzo(g,h,i)perylene	41.	J	530.		160.	J			1

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SUB46-VOA	SAMPLE ID> ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> DATE AMALYZED> MATRIX> UMITS>		12	027-H-0005-027H000545 124876 027H000545 06/08/95 06/14/95 Water UG/L	45	027-C-0008-0 027C000806 124858 027C000806 06/08/95 06/13/95 soil UG/KG	06	027-c-0008-12 027c000812 124877 027c000812 06/08/95 06/12/95 Soil UG/KG		027-H-0 027H000 124882 027H000 06/08/5 06/13/5 Water UG/L)944)5	
CAS #	Parameter	1446	VAL	1446	VAL	1446	VAL	1447	VAL	1447	VAL	
A CONTRACTOR OF THE STATE OF TH	Chloromethane	12.	U	10.	U	12.	υJ	12.	U		10. U	
	Bromomethane	12.	U	10.	U	12.	uJ	12.	U	A CONTRACTOR OF THE CONTRACTOR	10. U	
	Vinyl chloride	12.		10.	U	12.	IJ	12.	U	la la colora de describir de la colorida del colorida del colorida de la colorida del colorida de la colorida del colorida de la colorida de la colorida de la colorida de la colorida del	10. U	
	Chloroethane	12.	U	10.	U	12.	UJ.	12.	U	0.0000000000000000000000000000000000000	10. U	
	Methylene chloride	2.	J	10.	IJ	12.	UJ	12.	U		10. UJ	
67-64-1		12.	u	7.	J	12.	UJ.	12.	U U		18.	
	Carbon disulfide	12.	U	10.	U	12.	IJ	12.	U		2. J 10. U	
	1,1-Dichloroethene	12.	U	10.	U U	12.	UJ UJ	12.	U		10. U 10. U	
	1,1-Dichloroethane	12.	U	10. 10.	U	12.	ni ni	12.	น้ำ	tal to the second of the second of the second	10. U	
	1,2-Dichloroethene (total) Chloroform	12. 12.	U	10.	U	12.	UJ	12.	U		10. U	
	T,2-Dichloroethane	12.	Ü	10.	Ü	12.	บม	12,	Ü	o coccesto cuado um	10. U	
	2-Butanone (MEK)	12.	U	10.	U	12.	UJ	12.	U	A. A	10. U	
	1,1,1-Trichloroethane	12.	ย์ง	10.	Ü	12.	u	12.	Ü		10. U	
	Carbon tetrachloride	12.	UJ	10.	UJ	12.	UJ	12.	U		10. U	
	Bromodichloromethane	12.	นม	10.	Ü	12.	ŭ	12.	ŭ	en e	10. U	
	1,2-Dichloropropane	12.	UJ	10.	U	12.	UJ	12.	U	0.000	10. U	
	cis-1,3-Dichtoropropene	12.	บม	10.	Ü	12.	บัง	12.	Ū	M. ANNOCCOUGGOGGGGGGGGGGGGGGGGGGGGGGGGGGGGGG	10. U	
	Trichloroethene	12.	UJ	10.	U	12.	UJ	12.	u	republication of the second	10. U	
	Dibromochloromethane	12.	บง	10.	Ü	12.	U.J	12.	Ü	and the first and the first of the	10. U	
	1,1,2-Trichloroethane	12.	UJ	10.	Ū	12.	IJ	12.	U		10. U	
71-43-2		12.	เม	10.	Ü	12.	UJ	12.	Ū		10. U	
	trans-1,3-Dichloropropene	12.	LJ	10.	U	12.	UJ	12.	U		10. U	
	Bromoform	12.	UJ	10.	U	12.	UJ	12.	U		10. U	
	4-Methyl-2-Pentanone (MIBK)	12.	UJ	10.	U	12.	UJ	12.	U		10. U	
	2-Hexanone	12.	UJ	10.	U	12.	uı	12.	U		10. U	
	Tetrachloroethene	12.	UJ	10.	U	12.	UJ	12.	U	1	10. U	
	1,1,2,2-Tetrachloroethane	12.	UJ	10.	U	12.	UJ .	12.	U		10. U	
108-88-3		12.	UJ	1.	J	12.	UJ	12.	U	1	10. U	
108-90-7	Chlorobenzene	12.	UJ	10.	U	12.	uj	12.	U		10. U	
100-41-4	Ethylbenzene	12.	UJ	10.	U	12.	IJ	12.	U		10. U	
100-42-5		12.	UJ	10.	U	12.	UJ	12.	U		10. U	
	Xylene (Total)	12.	UJ	10.	U	12.	UJ	12.	U		10. U	

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DATA QUALIFICATION SUMMARY

NET, Inc. - 1411 Organics

SAMPLES:

015C005007, 015C019017, 015C020007, 021C000201, 021C000201MS,

021C000201MSD, 021H000202, 021H001017, 021C003010, 021H003048, 062C002020,

062C005020, 062H005041, 062C006020

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met. No action was necessary.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met. No action was required.

Continuing Calibration:

The Percent Differences (%D's) of bromomethane (31.4%) and chloroethane (40.6%) exceeded the 25% QC limit for the continuing calibration run on 6/01/95 at 13:47 on instrument HP5970H. The non-detect results for these compounds in associated sample 021C003010 were flagged as estimated (UJ).

The Percent Differences (%D's) of the following compounds exceeded the 25% QC limit for the continuing calibration run on 6/01/95 at 11:36 on instrument HP5970K:

bromomethane	25.4%
2-butanone	27.6%
2-hexanone	26.4%

The results for these compounds in associated sample 021H003048, which consisted entirely of non-detects, were flagged as estimated (UJ).

The Percent Differences (%D's) of dibromochloromethane (26.1%) and 1,1,2-trichloroethane (26.0%) exceeded the 25% QC limit for the continuing calibration run on 5/26/95 at 10:03 on instrument HP5970L. The results for these compounds in associated samples 015C005007, 015C020007, 015C019017, 062C006020, 062C005020, 062C002020 and 021C000201, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

Acetone and 2-hexanone were detected at 7.0 ug/kg and 3.0 ug/kg, respectively, in soil method blank VBLK052695L. The positive results for acetone in associated samples 015C005007, 015C020007, 015C019017, 062C006020, 062C005020, 062C002020 and 021C000201 less than 10X the blank amount were flagged as undetected (U) with the detection limit being raised to the level of contamination in each sample. There were no positive detections for 2-hexanone in the associated samples. No further action was necessary.

Acetone and xylene were detected at 2.0 ug/L and 1.0 ug/L, respectively, in water blank VBLK060195H. The result for acetone in associated sample 021H003048 was greater than 10X the blank amount, so no action was necessary. The result for xylene in the associated sample was a non-detect, so no action was required.

TIC's:

There were no TIC's reported in the blanks for this SDG. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Matrix Spike/Matrix Spike Duplicate (MS/MSD):

All MS / MSD criteria were met. No action was required.

VII.) Field Duplicates:

The field duplicates for samples 015C005007, 015C019017, 015C020007, 021C000201, 021H000202, 021H001017, 021C003010, 021H003048, 062C002020, 062C005020, 062C006020 and 062H005041 were not analyzed in this SDG. No action was required.

VIII.) Internal Standards Performance:

All Internal Standards Performance criteria were met. No action was required.

IX.) TCL Compound Identification:

All TCL criteria were met, so no action was necessary.

X.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met. No action was required.

XI.) Tentatively Identified Compounds (TIC's):

All TIC criteria were met, so no action was taken.

XII.) System Performance:

All criteria were met, so no action was necessary.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualification.

DATA ASSESSMENT NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP OLM01.8 Method; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # 1695

A validation was performed on the Semivolatile Data from SDG 1695. The data was evaluated based on the following parameters:

- * Data Completeness
- * Holding Times
- GC/MS Tuning
 - Calibration
- Blanks
- * Surrogate Recoveries
- Matrix Spike/Matrix Spike Duplicates
- * Field Duplicates
- * Internal Standard Performance
- * Compound Identification
- Compound Quantitation

Continuing Calibrations

Qualifications were required because the continuing calibration %Ds were not all within the 25% difference criteria.

^{* -} All criteria were met for this parameter.

DATA ASSESSMENT NARRATIVE SEMIVOLATILE ANALYSIS

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Continuing Calibrations, continued

Specific Findings

The continuing calibration standard, J487 contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

062S000701 4-chloroaniline (60.2%) 062S000801 N-nitrosodiphenylamine (67.2%) 062S000901

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates that 5% of data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

 \mathbf{R} = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample

CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is

reported.

U = The sample result for the blank contaminant is greater than the sample

CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte

value reported.

No Action = The sample result for the blank contaminant is greater than the sample

CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank

qualifiers.

SUMMARY OF DATA QUALIFICATIONS

IPLE ID	ANALYTE ID	\mathbf{DL}	QL	
∂62S000701 062S000801	4-chloroaniline N-nitrosodiphenylamine	+/-	J/UJ	
062S000901				

- * DL denotes the Form I qualifier supplied by the laboratory QL denotes the qualifier used by the data validation firm
 - + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED PESTICIDES/PCBs

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # 1695

A validation was performed on the Pesticide/PCB Data from SDG 1591. The data was evaluated based on the following parameters:

- Data Completeness
- Holding Times
- * Calibration
- * Blanks
- * Surrogate Recoveries
- Matrix Spike/Matrix Spike Duplicates
- Field Duplicates
 - Compound Identification/Quantitation

Compound Quantitation

Some results were reported with P flags to indicate that column quantitation %Ds were greater than 25%.

Specific Finding

All positive results reported with P flags are qualified as estiamted, J, due to column quantitation %Ds greater than 25%.

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates that 5% of data required qualifications/rejections.

^{* -} All criteria were met for this parameter.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

 \mathbf{R} = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample

CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is

reported.

U = The sample result for the blank contaminant is greater than the sample

CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte

value reported.

No Action = The sample result for the blank contaminant is greater than the sample

CRQL and is greater than 10X the method blank value. The sample

result for the blank contaminant is not qualified with any blank

qualifiers.

SUMMARY OF DATA QUALIFICATIONS

 $\mathbf{Q}\mathbf{L}$ **ANALYTE ID** DL SAMPLE ID All P flagged J All +

- DL denotes the Form I qualifier supplied by the laboratory QL denotes the qualifier used by the data validation firm + in the DL column denotes a positive result

 - in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE METALS

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # 1695

A validation was performed on the Metals Data from SDG 1695. The data was evaluated based on the following parameters.

- * Data Completeness
- * Holding Times
- * Calibrations
- * Blanks
- * Interferences
 - Matrix Spike Recovery
- * Matrix Duplicates
- * Field Duplicates
- * Laboratory Control Samples
- * Serial Dilutions
 - MSAs

Matrix Spike Recovery

Specific Finding

The Matrix Spike recoveries for soils for Antimony (45%) and Silver (66%) were below the lower control limits (<75%) but >30%. All positive and non-detect results are qualified as estimated, "J" or "UJ".

^{* -} All criteria were met for this parameter.

Laboratory Duplicate Analysis

Specific Finding

The duplicate analysis for Silver was less than 2 times the CRDL. No qualification is necessary.

MSAs

Specific Finding

The post digestion spike recovery for GFAA was above the upper control limits (>115%). All positive results for the listed samples below are qualified as estimated, "J".

Element	Sample IDs	% recoveries	<u>Action</u>
Thallium	062S701	116	no impact
Thallium	062S901	116	no impact

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
all soil samples	Sb and Ag.	+/U	J/UJ
All "B" results	all analytes	В	J

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APX9-RETAL	SAMPLE ID> ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> MATRIX> UNITS>	0625000701 1426085 0625000701 Soil	1	062-\$-0008-0 062\$000801 142609\$ 062\$000801 \$oil MG/KG	1	062-s-0009-01 0628000901 142610s 0628000901 Soil MG/KG		
CAS # Parameter		1695	VAL	1695	VAL	1695 VAL		
AS Antimony AS Arsenic BA Barium BE Beryllium CD Cadmium CR Chromium CO Copper PB Lead HG Hercury NI Nickel SE Selenium AG Silver TL Thellium V Vanadium ZN Zinc SN Tin		7.3 10.5 150. 0.98 4. 8.3 10.5 18.9 11.7 0.12 19.4 0.49 3. 0.73 24.1 59. 20.3	n n	7.2 10.4 113. 0.96 3.9 12. 9.7 18.9 14.1 0.12 16.4 0.48 0.72 0.72 25.4 54. 22.5	n1 n	7.3 UJ 9.7 113. 0.97 U 2.9 8.9 8.6 J 18. 11.1 0.12 U 16.3 0.49 U 0.73 UJ 0.73 U 20. 49.7		

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SM646-PEST	SAMPLE ID> ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> DATE EXTRACTED> DATE AMALYZED> MATRIX> UNITS>	062-s-0007-01 062s000701 142608 062s000701 02/13/96 02/15/96 02/20/96 Soil UG/KG	062-s-0008-01 0625000801 142609 0625000801 02/13/96 02/15/96 02/20/96 Soil UG/KG	062-s-0009-01 0625000901 142610 0625000901 02/13/96 02/15/96 02/20/96 \$ail UG/KG			
CAS #	Parameter	1695 VAL	1695 VAL	1695 VAL			
309-00-2		2. U	2. U	2. U			0.0000000000000000000000000000000000000
	gemma-BHC (Lindane)	2. U	2. U	2. U			
m_{ext} , m_{ext} and m_{ext} and m_{ext} and m_{ext}	alpha-BHC	2. U	2. U	2. U		**************************************	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
319-85-7	beta-BHC	2. U	2. U	2. U			
Anomorphism (a)	del ta-BHC	2. U	2. U	2. U			
	4,41-DDD	4.1 U	4. U	4.1 U			
	4,41-DDE	4.1 U	4. U	4.1 U		000000000000000000000000000000000000000	process, escapa jaga, chapa, c personal escapa con contrata de la contrata de la contrata de la contrata de la
	4,4'-DDT	4.1 U	3. J	4.1 U			
	Dieldrin	4.1 U	11.	4.1 U			S
959-98-8	Endosulfan I	2. U	2. U	2. U			
	Endosulfen II	4.1 U	4. U	4.1 U			65/15/22:1060.0000000000000000000000000000000000
1031-07-8	Endosulfan sulfate	4.1 U	4. U	4.1 U			
72-20-8		4.1 U	4. U	4.1 U			10
	Endrin aldehyde	4.1 U	4. U	4.1 U			
	Heptachlor	2. U	2. U	2. U			0000-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0
	Heptachlor apoxide	2. U	2. U	2. U			
	Methoxychlor	20. U	20. U	20. U			
8001-35-2	Toxaphene	41. U	40. U	41. U			
12674-11-2	Aroclor-1016	41. U	40. U	41. U			
11104-28-2	Aroctor-1221	41. U	40. U	41. U	1		
11141-16-5	Aroclor-1232	41. U	40. U	41. U	<u> </u>		
53469-21-9	Aroctor-1242	41. U	40. U	41. U			
12672-29-6	Aroclor-1248	41. U	40. U	41, U			
11097-69-1	Aroctor-1254	41. U	40, U	41. U			
11096-82-5	Aroclor-1260	41. U	40. U	41. U			
53494-70-5	Endrin ketone	4.1 U	4. U	4.1 U	1		
5103-71-9	alpha-Chlordane	2. U	2. U	2. U			
5103-74-2	gamma-Chlordane	2. U	2. U	2. U			
	Technical Chlordane	41. U	40. U	41. U			
	Chlordane	41. U	40. U	41. U			

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SW846-SVOA	SAMPLE ID> ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> DATE EXTRACTED> MATRIX> UNITS>	062-S-0007-01 062S000701 142608 062S000701 02/16/96 02/20/96 Soil ug/Kg		062-S-0008-0 0625000801 142609 0625000801 02/16/96 02/20/96 5011 ug/Kg	1	062-s-0009-01 0625000901 142610 0625000901 02/16/96 02/20/96 \$011 ug/kg				
CAS #	Parameter	1695	VAL	1695	VAL	1695	VAL			
108-95-2	Phenol	410.	U	400.	U	410.	U			
111-44-4	bis(2-Chloroethyl)ether	410.	U	400.	U	410.	U			
95-57-8	2-Chlorophenol	410.	U	400.	U	410.	U			
541-73-1	1,3-Dichlorobenzene	410.	U	400.	U	410.	U			
106-46-7	1,4-Dichlorobenzene	410.	U	400.	U	410.	U			
95-50-1	1,2-Dichtorobenzene	410.	U	400.	U	410.	U			
	2-Methylphenol (o-Cresol)	410.	U	400.	U	410.	U		000.00.00.0000000000000000000000000000	8000-500-6008000 5.00 / 11000 PARTICIPATOR -
108-60-1	2,2'-oxybis(1-Chloropropane)	410.	U	400.	U	410.	U			
	4-Methylphenol (p-Cresol)	410.	U	400.	U	410.	U			
	N-Nitroso-di-n-propylamine	410.	U	400.	U	410.	U			
	Hexach Loroethane	410.	U	400.	U	410.	U			
98-95-3	Nitrobenzene	410.	U	400.	U	410.	U			
78-59-1	I sophorone	410.	U	400.	U	410.	U			
88-75-5	2-Nitrophenol	410.	U	400.	U	410.	U			
105-67-9	2,4-Dimethylphenol	410.	U	400.	U	410.	U			
	2,4-Dichlorophenol	410.	U	400.	U	410.	U			
	1,2,4-Trichlorobenzene	410.	U	400.	U	410.	U			
91-20-3	Naphtha Lene	410.	IJ	400.	U	410.	U			
	4-Chloroaniline	410.	UJ	400.	UJ	410.	UJ			
	Hexachlorobutadiene	410.	U	400.	U	410.	U			
	bis(2-Chloroethoxy)methane	410.	U	400.	U	410.	U			
	4-Chloro-3-methylphenol	410.	Ū	400.	U	410.	U			
	2-Methylnaphthalene	410.	U	400.	Ū	410.	U			
	Hexachlorocyclopentadiene	410.	Ū	400.	Ū	410.	U			
	2,4,6-Trichlorophenol	410.	U	400.	U	410.	U	ennen makken nya manan ya makembaha atau atau atau atau atau atau atau a	and a second sec	
	2,4,5-Trichlorophenol	1000	ับ	1000.	ŭ	1000.	Ü			
	2-Chloronaphthalene	410.	U	400.	U	410.	U			
SUCCESSES AND	2-Nitroaniline	1000.	Ŭ	1000.	Ŭ	1000.	ŭ			
Annual Control of the	Dimethyl phthalate	410.	U .	400.	U	410.	U		Page the Marco for the series (MARCO for the Marco Marco for Marco	A STATE OF THE STA
	Acenaphthylene	410.	U	400.	Ü	410.	บั			
	2,6-Dinitrotoluene	410.	U	400.	Ü	410.	U	hitelanning control of the control o	en e	econogramación y presión, no contratorno de la 19.00 de 20.00
	3-Nitroaniline	1000	Ŭ	1000.	Ü	1000	บั			
	Acenaphthene	410.	U	400.	U	410.	U		Decree 2000 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200 - 200	contract (00 2000 000) - 200 , 2000 - 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100 , 100
	2,4-Dinitrophenol	1000.	Ŭ	1000.	ី បី ៈ	1000.	ŭ			
	2,4-pinitrophenot 4-Nitrophenol	1000.	U	1000.	U	1000.	U		To the state of th	 pontpontpriparite to a non-construct of an incident
A. A	4-nitrophenot D ibenzofura n	410.	U	400.	Ü	410.	ย			
125.04.7	n ideixaidigu	410.	78 78 555550	*****		7.104				

NSA MEMPHIS NAS MEMPHIS, RFI, ASSEMBLY C SWMU 62

Page: 4 Time: 15:25

				•	SWMU 6	0.4			
Su846-SWIA	SUB46-SVOA SAMPLE ID> CRIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE EXTRACTED> DATE EXTRACTED> MATRIX> UNITS>		1	062-s-0008-1 0625000801 142609 0625000801 02/16/96 02/20/96 Soil ug/Kg	01	062-s-0009 0625000901 142610 0625000901 02/16/96 02/20/96 Soil ug/Kg			
CAS # Paramete	ir	1695	VAL	1695	VAL	1695	YAL		
86-73-7 Fluorem 100-01-6 4-Nitro 534-52-1 2-Methy 86-30-6 N-Nitro 101-55-3 4-Bromo 118-74-1 Hexachlo 85-01-8 Pentach 120-12-7 Anthrac 84-74-2 Di-n-bu 206-44-0 Fluoran 129-00-0 Pyrere 85-68-7 Butylbe 91-94-1 3,31-01 56-55-3 Benzo(a 218-01-9 Chrysen	chthalate cphenylphenylether caniline 1-4,6-Dinitrophenol codiphenylamine chenyl-phenylether crobenzene lorophenol nrene ene le cylphthalate chlorobenzidine canthracene e thylhexyl)phthalate (BEHP) tyl phthalate c)fluoranthene c)fluoranthene c)pyrene 1,2,3-cd)pyrene a,h)anthracene	410. 410. 410. 410. 1000. 1000. 410. 410		400. 400. 400. 1000. 1000. 1000. 400. 40		410. 410. 410. 410. 1000. 1000. 410. 410	U U U U U U U U U		

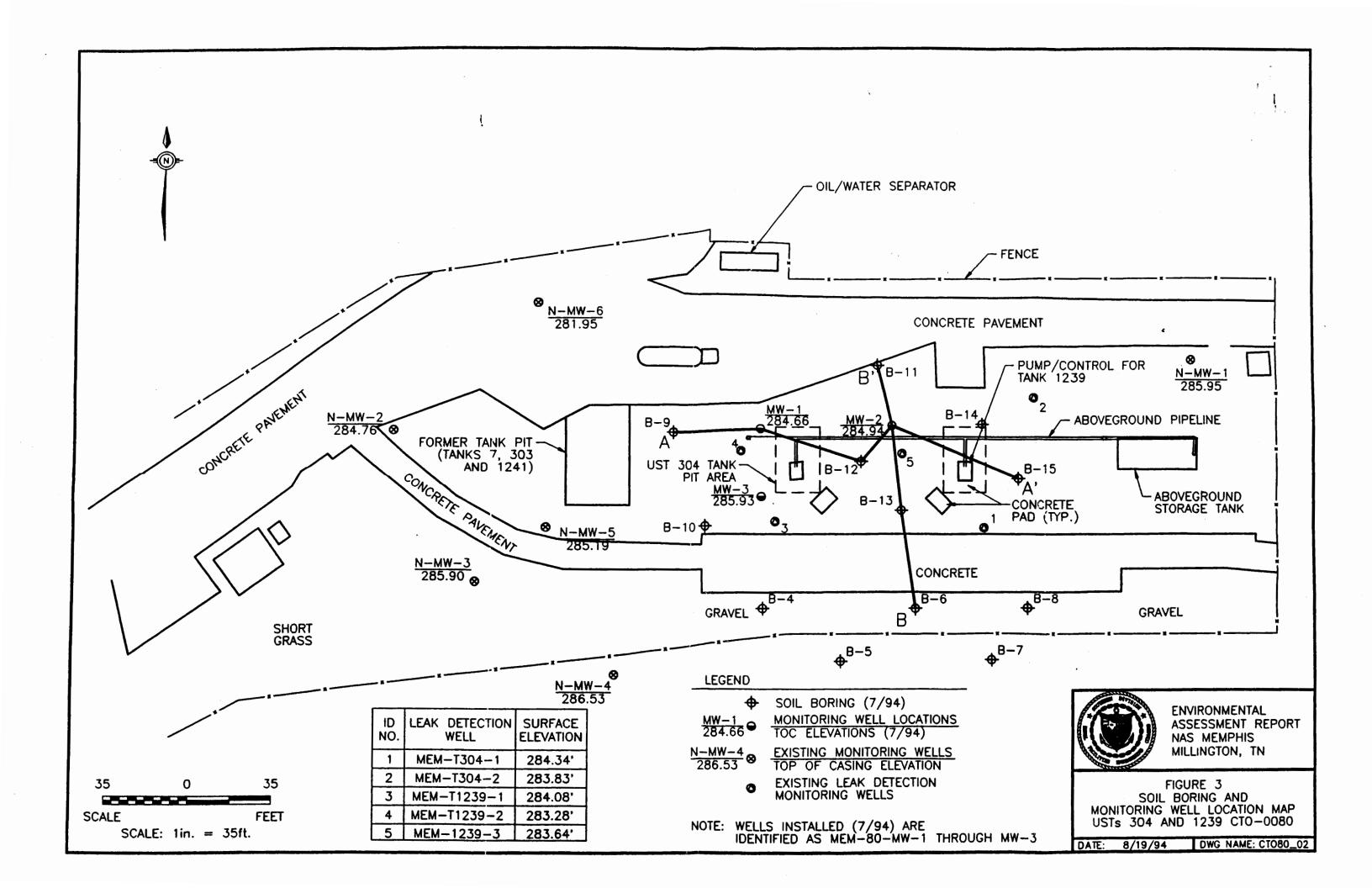
NSA MEMPHIS NAS MEMPHIS, RFI, ASSEMBLY C SWMU 62

Page: 5 Time: 15:25

SUB46-VOA	SAMPLE ID> ORIGINAL ID> LAB SAMPLE ID> ID FROM REPORT> SAMPLE DATE> DATE AMALYZED> MATRIX> UMITS>	062C002020 123957 062C002020 05/23/95 05/26/95 Soil	20	062-C-0050- 062C005020 123956 062C005020 05/23/95 05/26/95 soil UG/KG	20	062-H-0050-6 062HD05041 123959 062H005041 05/23/95 05/27/95 Water UG/L	1	062-C-0060-20 062C006020 123955 062C006020 05/23/95 05/26/95 Soft UG/KG		
CAS # Paremet	er	1411	VAL	1411	VAL	1411	VAL	1411 VAL		
74-87-3 Chlorom		13.	U	13.	U	10.	U	12. U		
74-83-9 Bromome		13.	U	13.	U	10.	U	12. U		
75-01-4 Vinyl c		13.	U	13.	U	10.	U	12. U		
75-00-3 Chioroe		13.	U	13.	Ų	10.	U	12. U		
75-09-2 Methyle		13.	U	2.	ل ***********	1.	J	1. J 12. U		
67-64-1 Acetone		13.	U	16.	U	9.	J U	12. U 12. U		
75-15-0 Carbon	acadalatationale i silabor con conserva con una conserva de la conserva de la conserva de la conserva de la con	13. 13.	U	13. 13.	U	10. 10.	U	12. U		
75-35-4 1,1-Dic 75-34-3 1,1-Dic		13.	U	13.	U	10.	U	12. U	•	
	hioroethene (total)	13.	Ü	13.	Ŭ	10.	Ŭ	12. U		
67-66-3 Chlorof		13.	U	13.	U	10.	U	12. U		*******************************
107-06-2 1,2-Dic		13.	Ū	13.	ŭ	10.	U	12, U		
78-93-3 2-Butan		13.	U	13.	U	10.	U	12. U		
71-55-6 1,1,1-1	unidadus de la companya de la compa	13.	U	13.	U	10.	U	12. U		
56-23-5 Carbon		13.	U	13.	U	10.	U	12. U		**************************************
75-27-4 Bromodi	chloromethane	13.	U	13.	U	10.	U	12. U		
78-87-5 1,2-Dic	hloropropane	13.	U	13.	U	10.	U	12. U		
10061-01-5 cis-1,3	-Dichloropropene	13.	U	13.	U	10.	U	12. U		
79-01-6 Trichlo	roethene	13.	U	13.	U	10.	U	12. U	04.00.0000.000.000.000.000.0000.00000.0000	
124-48-1 Dibromo		13.	W	13.	UJ	10.	U	12. UJ		
79-00-5 1,1,2-T	richloroethane	13.	UJ	13.	IJ	10.	U	12. UJ		
71-43-2 Benzene		13.	U	13.	U	10.	U	12. U		
	,3-Dichloropropene	13.	U	13.	U	10.	U	12. U		
75-25-2 Bromofo		13.	U	13.	U	10.	U	12. U		
	l-2-Pentanone (MIBK)	13.	U	13.	U	10.	U	12. U 12. U		
591-78-6 2-Hexan		13.	U	13.	U	10.	U	12. U		
127-18-4 Tetrach		13. 13.	U U	13.	U	10.	. B	12. U		
	-Tetrachloroethane	13.	U	13.	U	10.	J	12. U		
108-88-3 Toluene 108-90-7 Chiorob		13.	U	13.	U	10.	Ü	12. U		
100-41-4 Ethylbe		13.	U	13.	U	10.	U	12. U	A 100 TO 100	•
100-41-4 Ethytbe		13.	ŭ	13.	Ü	10.	ับ	12. U		1
1330-20-7 Xylene		13.	U	13.	U	10.	Ü	12. Ū		Annual Company of the

Attachment 2

Miscellaneous Soil Boring and Monitoring Well Logs



DEPTH (FEET)	SAMPLE 1774 SAMPLE DEPTH	BLOWS/5 FT.)RGANIC VAPOI. (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
	JRFACE -		
	э	0	0.0-3.0' CLAYEY SILT, TAN TO TAN AND LIGHT BROWN, FIRM TO STIFF.
5_	3	400	3.0-8.0° CLAYEY SILT, GREYISH BROWN, MOIST, FIRM (WITH STRONG HYDROCARBON ODOR).
10	æ	2971	8.0-13.0° CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
147	3		13.0-14.0' CLAYEY SILT, GREYISH BROWN, SOFT. 14.0-14.5' CLAYEY SILT, BROWN, STIFF. 14.5-15.4' CLAYEY SILT, GRAYISH BROWN, SOFT. 15.4-16.4' SILTY CLAY, DARK BROWN, FIRM.
- 20	20.5		18.0-20.5' CLAYEY SILT TO SILTY CLAY, BROWN, MOIST, FIRM. 20.5-23.0' SILTY CLAY, TAN MOTTLED YELLOW TAN, FRW TO STIFF.
			DISCONTINUED BORING AT 23.0 FEET.
2 <u>5</u>			
30			
	ary of		SOIL BORING B/MW-1



ENVIRONMENTAL ASSESSMENT REPORT NAS MEMPHIS CTO-0080 SOIL BORING B/MW-1 UST's 304 & 1239 MILLINGTON, TN

DATE INSTALLED: 7/11/1994 PROJ. #: CTOOO

DATE: 8/4/1994

SAMPLE LYPE SAMPLE SAMPLE DEPTH BLOWS/5 FT RCANIC VAPOR

DESCRIPTION OF SUBSURFACE MATERIALS

٥	i vi			
s	URFACE -	Grass		
	0	4	0.0-10' CLAYEY SILT, TAN WITH CONCRETE FRAGMENTS (FILL). 1.0-3.4' CLAYEY SILT, TAN MOTTLED GREY AND BLACK, STIFF.	
5	3.4	421	3.4-5.8' CLAYEY SILT, GRAYISH BROWN, MOIST, FIRM (WITH HYDROCARBON COOR).	
	5.8	102	5.8-8.0' SILTY CLAY, GRAYISH BROWN, MOIST, SOFT (WITH SLIGHT HYDROCARBON ODOR).	
	8	275	8.0-10.5' CLAYEY SILT, GREYISH BROWN, MOIST, SOFT.	
	0.5	92	C.5-15.2' SILTY CLAY, GREYISH BROWN TO TAN MOTTLED GREY, MOIST, SOFT.	
	.3	27		
15	15.5	120	15.2-16.0' SILTY CLAY, GREYISH BROWN, VERY MOIST, SOFT.	
2	.8	234	16.0-18.0' SILTY CLAY, DARK BROWN, MOIST, FIRM. 18.0-20.5' SILTY CLAY, DARK BROWN, MOIST, FIRM (WITH STRONG HYDROCARBON ODOR).	
20	20.5	136	20.5-23.0' SILTY CLAY, BROWN, MOIST, FIRM (WITH HYDROCARBON ODOR).	. •
25			DISCONTINUED BORING AT 23.0 FEET.	
-				
- 30				



ENVIRONMENTAL ASSESSMENT REPORT NAS MEMPHIS CTO-0080 SOIL BORING B/MW-2
UST's 304 & 1239
MILLINGTON, TN

DATE INSTALLED: 7/11/1994 PROJ. #: CTOOC

DATE: 8/4/1994

SAMPLE DEPTH

SAMPLE
DEPTH

BLOWS / 5 F1

RGANIC VAPOR

(PPM) DESCRIPTION OF SUBSURFACE MATERIALS SURFACE - Grass ٥ 0.0-3.0° CLAYEY SILT, TAN GRADING TO TAN MOTTLED GREY, SLIGHTLY MOIST, STIFF. 30 3.0-8.0' CLAYEY SILT, GREYISH BROWN, WITH BLACK STAINING, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR). 3 56 . 8 48 İ 8.0-13.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH STRONG HYDROCARBON COOR). 13.0-18.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH STRONG HYDROCARBON COOR). . : 3 18.0-20.5' SILTY CLAY, DARK BROWN, MOIST, FIRM TO STIFF (WITH HYDROCARBON ODOR). :8 20.5-23.0' SILTY CLAY, BROWN GRADING TO TAN MOIST, FRM TO STIFF (WITH SLIGHT HYDROCARBON GDOR). 20.5 112

DISCONTINUED BORING AT 23.0 FEET.



30

ENVIRONMENTAL ASSESSMENT REPORT NAS MEMPHIS CTO-0080 SOIL BORING B/MW-3 UST's 304 & 1239 MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CTOOD

DATE: 8/4/1994

SAMPL TYPE SAMPLE	DEPTH BLOWS / 5-1-1 JRGANIC VAPOR (ppm.)	DESCRIPT 0.	N OF SUBSURFICE Aterials
SURFACE	- Grass		
5		4.0-6.0 CLAYEY SILT, GREYISH BROMOIST, VERY FIRM TO STIFF (WITH HYDROCARBON ODOR).	OWN.
1 <u>d</u>		9.0-11.01 CLAYEY SELT, GREYISH BE MOIST, FIRM TO SOFT (WITH HYDRO)	ROWN, VERY CARBON COOR).
15 20 25 30		DISCONTINUED BORING AT 11.0 FEET	
da d		NVIRONMENTAL	SOIL EORING B-3A



ENVIRONMENTAL ASSESSMENT REPORT NAS MEMPHIS CTO-0080

UST's 304 & 1239 MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CT0001

DATE:

8/4/1994

DESCRIPTION OF SUBSURFACE MATERIALS

SURFACE -	- Crass
-----------	---------

	0 1	9	0.0-1.5" CRUSHED LIMESTONE (FILL)
			1.5-3.0' CLAYEY SILT, GREYISH BROWN, SLIGHTLY MOIST, STIFF.
5	3	2	3.0-6.0' CLAYEY SILT, GREYISH BROWN, SLIGHTLY MOIST, FIRM (WITH HYDROCARBON ODOR)
	5. 5	9	6.0-7.0° CLAYEY SILT, BROWN MOTTLED BEIGE, MOIST, STIFF.
	8	238	7.3-8.0' CLAYEY SILT, GREYISH BROWN MOTTLED GREY, MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).
10	: 0.5	.21	8.0-13.0° CLAYEY SILT, BROWNISH GREY MOTTLED GREY, VERY MOIST, FIRM (WITH HYDROCARBON DOOR).
1 4	:3	11	13.0-18.0' CLAYEY SILT, BROWNISH GREY MOTTLED GREY, VERY MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).
-	5.5	4.8	

DISCONTINUED BORING AT 18.0 FEET.

20|

ENVIRONMENTAL ASSESSMENT REPORT NAS MEMPHIS CTO-0080

SOIL BORING B-4 UST's 304 & 1239 MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CT0008

DATE: 8/4/1994



DEPTH (FEET)	SAMPLE SAMPLE	BI OWS / 5 1 I)RGANIC VAPOI. (ppm.)
SUF	RFACE -	Grass

DESCRIPTION OF SUBSURFACE MATERIALS

_	JUNIACE -	Grass		
	0	15	0.0-2.0° CLAYEY SILT, TAN MOTTLED BROWN. SLIGHTLY MOIST, STIFF (FILL?) 2.0-3.0° SILT, SLIGHTLY CLAYEY, DARK	
	3	15	BROWN, FIRM. 3.0-5.0' CLAYEY SILT, DARK BROWN, MOIST, FIRM.	
_				
5	5	4	5.0-8.0' CLAYEY SILT, TAN MOTTLED GREY AND DARK BROWN, SLIGHTLY MOIST, STIFF (IN SITU SOIL).	
	8	1	8.0+13.0 CLAYEY SILT, TAN MOTTLED GREY AND DARK BROWN, MOIST, STIFF.	
10				
	.3	4	LIO 15 ST CLAYEY SUIT TAN MOTTIFD CREY	
			13.0-15.5° CLAYEY SILT, TAN MOTTLED GREY GRADING TO BROWN MOTTLED GREY, VERY YOIST, FIRM.	
13	15.5	214	15.5-18.0' SAME AS ABOVE (WITH SLIGHT	
			HYDROCARBON ODOR).	
	1 18	229	18.0- 20.5' SAME AS ABOVE (WITH SLIGHT HYDROCARBON ODOR).	
20	20.5	0	20.5-23.0° CLAYEY SILT TO SILTY CLAY, DARK GREYISH BROWN GRADING TO DARK REDDISH	
			BROWN, MOIST, STIFF.	
	23	10	23.0-28.0' SILTY CLAY GRADING TO CLAYEY SILT, DARK BROWN GRADING TO BROWN MOTTLED	
25	, -		TAN, MOIST TO VERY MOIST, STIFF TO FIRM.	
			DISCONTINUED BORING AT 28.0 FEET.	
30	4		•	



ENVIRONMENTAL ASSESSMENT REPORT NAS MEMPHIS CTO-0080 SOIL BORING B-5 UST's 304 & 1239 MILLINGTON, TN

DATE INSTALLED: 7/13/1994 PROJ. #: CTOO

DATE: 8

8/4/1994

SAMPLE TYPE SAMPLE TYPE SAMPLE DEPTE BEPTE BEPTE BECANIC VAPON (ppm)

DESCRIPTION OF SUBSURFACE MATERIALS

DE	SA :	BI C								
St	SURFACE - Crusned Limestone .									
	0	15	0.0-2.5' CLAYEY SILT, BROWN, STIFF							
5	3	4	2.5-3.0' CLAYEY SILT, DARK GREY, MOIST, SOFT. 3.0-6.0' CLAYEY SILT, GREYISH BROWN, MOIST, SOFT.							
	5.5	27	6.0-8.0' CLAYEY SILT, MOTTLED BROWN. TAN, AND GREY, MOIST, STIFF.							
10	8	324	8.0-13.0° CLAYEY SILT, BROWN MOTTLED GREY AT TOP 1° GRADING TO GREYISH BROWN MOTTLED GREY, MOIST, SOFT (WITH HYDROCARBON ODOR).							
	0.51	3031	 							
15	3	288	13.0-18.0' CLAYEY SILT, GREYISH BROWN MOTTLED GREY WITH SOME BLACK STAINING?, WET, SOFT (WITH SLIGHT HYDROCARBON GDOR).							
	45. 5	304								
			DISCONTINUED BORING AT 18.0 FEET.							
201										
_										
- 25										
-										
- 30			-							



ENVIRONMENTAL ASSESSMENT REPORT NAS MEMPHIS CTO-0080 SOIL BORING B-6 UST's 304 & 1239 MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CTOO(

DATE: 8/4/1994

SAMPLE INTERPRETED SAMPLE DEPTH BEOWS/ 5 FT DRGANIC VAPOR DESCRIPTION OF SUBSURFACE MATERIALS SURFACE - Grass 0.0-40' CLAYEY SILT, TAN TO BROWN. DRY TO SLIGHTLY MOIST, STIFF. 49 4.0-8.0' CLAYEY SILT, BROWN, VERY MOIST, FIRM. 5 8.0-8.5' CLAYEY SILT, TAN TO BROWN, SLIGHTLY MOIST, FIRM, FRIABLE. 8 14 86 8.5-13.0' CLAYEY SILT, GREYISH BROWN, MOTTLED GREY AND TAN, MOIST, FIRM · 0.5 (WITH HYDROCARBON ODOR). ; 3 94 13.0-18.0' SAME AS ABOVE (WITH HYDROCARBON ODOR). 15.**5** 81 18.0-20.5' CLAYEY SILT, GREYISH BROWN, MOTTLED TAN, MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR). 18 7 20.5-22.0' CLAYEY SILT, GREY, VERY MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR). 20.5 22.0-23.0' SILTY CLAY, DARK BROWN, MOIST. STIFF (CIL SHEEN ON SAMPLER). 23.0-28.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, FIRM (WITH TRACE OF STAINING). 23 25.5 1 DISCONTINUED BORING AT 28.0 FEET. 30



ENVIRONMENTAL ASSESSMENT REPORT NAS MEMPHIS CTO-0080 SOIL BORING B-7 UST's 304 & 1239 MILLINGTON, TN

DATE INSTALLED: 7/14/1994 PROJ. #: CTO00

DATE: 5/4/1994

SAMPLE THE
SAMPLE
DEPTH
BLOWS/5-11
NRGANIC VAPOR DEPTH (FEFT) DESCRIPTION OF SUBSURFACE VATERIALS SURFACE - Crushed Limestone 0 ! 51 | 0.0-0.5' CLAYEY SILT, BROWN, SLIGHTLY MOIST, FIRM. 0.5-3.0' CLAYEY SILT, GREYISH EROWN, SLIGHTLY MOIST, FIRM. 3.0-8.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT GRADING TO CLAYEY SILT, GREY MOTTLED BROWN, STIFF, (WITH SLIGHT HYDRO-3 1 CARBON ODOR). 27 5.5 185 8.0-13.0' CLAYEY SILT, GREYISH BROWN MOTTLED GREY, MOIST, FIRM (WITH HYDROCARBON COOR). 8 10.5i 2391 .3 : 306 13.0-18.01 CLAYEY SILT, GREYISH BROWN MOTTLED GREY, MOIST, FIRM (WITH HYDROCARBON COOR). DISCONTINUED BORING AT 18.0 FEET. 20! 25 30



ENVIRONMENTAL ASSESSMENT REPORT NAS MEMPHIS CTO-0080 SOIL BORING B-8 UST's 304 & 1239

MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CTOOC

DATE: 8/4/1994

SAMPLE THE SAMPLE DEPTH BLOWS/5 FT RGANIC VAPOR DESCRIPTION: OF SUBSURFACE MATERIALS SURFACE - Grass 60 | 0.0-3.0" CLAYEY SILT, TAN TO BROWN. SLIGHTLY MOIST, STIFF, (WITH TRACES OF SUBROUNDED GRAVEL) (FILL). Э 3 16 | 3.0-4.6' CLAYEY SILT TO SILTY CLAY, TAN AND BROWN, VERY MOIST, (WITH TRACES OF GRAVEL) (FILL?). 4.6-8.0' CLAYEY SILT, GREYISH BROWN WITH SOME BLACK STAINING, MOIST, SOFT (WITH SLIGHT HYDROCARBON ODOR). 5 4.6 8 3 8.0-10.11 CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT. 3 10.1-14.71 CLAYEY SILT TO SILTY CLAY, TAN TO BROWN MOTTLED GREY, MOIST, FIRM. 0.1 ٠3 2 14.7-18.0' CLAYEY SILT, DARK BROWN, MOIST, STIFF (WITH TRACES OF FINE WET VERTICAL SEAMS OF GREY SILT)(WITH SLIGHT HYDROCARBON COOR). -4.7 67 DISCONTINUED BORING AT 18.0 FEET. 20 30



ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO-0080

SOIL BORING B-9
UST's 304 & 1239
MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CTOO0

DATE: 8/4/1994

BLOWS/ 5 FT REGANIC VAPOR (PPIN) DESCRIPTION OF SUBSURFACE MATERIALS SURFACE - Grass 0.0-3.0° CLAYEY SILT, BROWN MOTTLED TAN. SLIGHTLY MOIST, STIFF (IN SITU SOIL). 0 20 3 3.0-8.0' CLAYEY SILT, BROWN GRADING TO BROWN MOTTLED GREY, SLIGHTLY MOIST, STIFF, (GREY MOTTLING IS SILT IN BOTTOM 1.5 FEET) (WITH SLIGHT HYDROCARBON ODOR). 5.5 21 8 8.0-13.0° CLAYEY SILT, BROWN MOTTLED BEIGE, GRADING TO SILT, BROWN MOTTLED GREY, STIFF, MOIST (WITH SLIGHT HYDROCARBON ODOR). 9 10.5 191 13.0-18.0' CLAYEY SILT, BROWN MOTTLED BEIGE AND LIGHT GREY, FIRM, VERY MOIST. : 3 9 15.5 13 DISCONTINUED BORING AT 18.0 FEET. 20 25 30



ENVIRONMENTAL ASSESSMENT REPORT NAS MEMPHIS CTO-0080 SOIL BORING B-10 UST's 304 & 1239 MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CTOOC

DATE: 8/4/1994

DEPTH (FEET)
SAMPLE THE
SAMPLE
DEPTH
BLOWS/5 FT
)RGANIC VAPOR

DESCRIPTION OF SUBSURFACE MATERIALS

s	SURFACE -	Grass	
	0	40	0.0-3.0' CLAYEY SILT, TAN, SLIGHTLY MOIST, STIFF (IN SITU SOIL?).
5_	3	31	3.0-8.0° CLAYEY SILT, BROWN, SLIGHTLY MOIST, STIFF.
10	. 8	25	8.0-10.5 CLAYEY SILT, BROWN MOTTLED GREY, VERY MOIST, FIRM.
	0.5i	!5	10.5 - 13.0" CLAYEY SILT, GREYISH BROWN MOTTLED GREY (WITH SOME BLACK IN LOWER PORTION), VERY MOIST, FIRM.
1 6	.3	32	13.0-15.5' CLAYEY SILT, TAN MOTTLED CREY, MOIST, FIRM.
,	'5. 5	16	15.5-18.0' SILTY CLAY BROWNISH GREY GRADING TO BROWN AND GREY TO DARK BROWN, MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).
20			DISCONTINUED BORING AT 18.0 FEET.
 	-		
<u>25</u>			
1 -1			
<u>30</u>			



ENVIRONMENTAL ASSESSMENT REPORT NAS MEMPHIS CTO-0080 SOIL BORING B-11 UST's 304 & 1239 MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CTOOO

DATE: 8/4/1994

DEPTH (FEET)	SAMPLE TYPE SAMPLE DEPTH	BLOWS/5 FT. JRGANIC VAPOR (port)	DESCRIPTI ún of Subsurface Materials
S	URFACE -	Crass	
	0	40	D.D-3.8' CLAYEY SILT, BROWN MOTTLED BEIGE AND DARK BROWN, SLIGHTLY MOIST, STIFF (FILL?).
5_	3.8	234	3.8-5.8' CLAYEY SILT, GREYISH BROWN WITH BLACK STAINING, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
10	8	150	8.0-14.5 CLAYEY SILT, GREYISH BROWN WITH BLACK STAINING, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
15	: 3.0	1 37	14.5-14.7' SILT, BROWN, STIFF, DRY. 14.7-14.9' CLAYEY SILT, BROWN WITH BLACK STAINING, WITH TRACES OF ROUNDED GRAVEL, VERY MOIST (WITH TRACES OF OIL AND STRONG HYDROCARBON ODOR). 14.9-16.0' CLAYEY SILT TO SILTY CLAY, SLIGHTLY MOIST, VERY STIFF.
20	. 18	242	18.0-23.0° CLAYEY SILT, DARK GREYISH BROWN, MOIST, STIFF (WITH STRONG HYDROCARBON CDOR).
2:	23	26¹ 257	MOIST, FRIABLE (WITH HYDROCARBON ODOR).
30			DISCONTINUED BORING AT 28.0 FEET.



ENVIRONMENTAL ASSESSMENT REPORT NAS MEMPHIS CTO-0080 SOIL BORING B-12 UST's 304 & 1239 MILLINGTON, TN

DATE INSTALLED: 7/13/1994 PROJ. #: CTOOC

DATE: 8/4/1994

SAMPLE TYPE SAMPLE TYPE SAMPLE DEPTHE BLOWS/ 5-FT NRGANIC VAPOR (PPPL)

DESCRIPTION OF SUBSURFACE MATERIALS

SURFACE -	Grass
-----------	-------

-	JURFACE -	Grass		
	0		0.0-3.0' CLAYEY SILT, TAN TO BROWN. SLIGHTLY MOIST, FIRM TO STIFF (FILL?)	
	3	15	3.0-8.0° CLAYEY SILT, BROWN MOTTLED TAN, VERY MOIST, SOFT.	
5				
1	8	9	8.0-13.0° CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT.	
İ	. 3	6	13.0-14.0' CLAYEY SILT, BROWN, WET, SOFT.	
1.	4	77	14.0-14.5 CLAYEY SILT, GREYISH BROWN WITH BLACK STAINING, WET, SOFT (WITH HYDROCARBON ODOR)	
			14.5-18.0' CLAYEY SILT, CREYISH BROWN GRADING TO BROWN, MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).	
20	18	49	18.0-21.0' CLAYEY SILT, LIGHT BROWN GRADING TO DARK BROWN, MOIST, STIFF.	
	20.5	3001	21.0-23.01 CLAYEY SILT, DARK BROWN, VERY MOIST, FRIABLE (WITH HYDROCARBON COOR).	
25	23	327	23.0-26.0' CLAYEY SILT, DARK GREYISH BROWN, VERY MOIST, FIRM (WITH TRACES OF OIL AND STRONG HYDROCARBON ODOR).	· •
	25.5	18	26.0-28.0' CLAYEY SILT, BROWN MOTTLED TAN, MOIST, FIRM TO STIFF (WITH SLIGHT HYDROCARBON ODOR).	
Γ.			DISCONTINUED BORING AT 28.0 FEET.	
30)			
			•	
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ENVIRONMENTAL ASSESSMENT REPORT NAS MEMPHIS CTO-0080 SOIL BORING B-13 UST's 304 & 1239 MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CTO00

DATE:

8/4/1994

DEPTH (FEET)	SAMPLE TYPE SAMPLE DEPTH	BLOWS / 5 FT	(ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
\vdash	JRFACE -			
	0		70	0.0-3.0' CLAYEY SILT, BROWN MOTTLED BEIGE, SLIGHTLY MOIST, STIFF.
5_	. 3		64	3.0-8.0' CLAYEY SILT, BROWN WITH DARK BROWN STREAKS, MOIST, FIRM.
10	8	•	96	8.0-13.0° CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH HYDROCARBON ODOR).
15	3		23	13.0-18.0° CLAYEY SILT, BROWN, VERY MOIST, FIRM TO SOFT (WITH SLIGHT HYDROCARBON COOR).
20	:			DISCONTINUED BORING AT 18.0 FEET.
-				
2 <u>5</u>				
- 30 -		-		



ENVIRONMENTAL ASSESSMENT REPORT NAS MEMPHIS CTO0080 SOIL BORING B-14 UST's 304 & 1239 MILLINGTON, TN

DATE: INSTALLED: 7/13/1994 PROJ. #: CT0001

DATE: 8/4/1994

SAMPLE 1819 SAMPLE SAMPLE SAMPLE OEPTH	BLOWS/ 5 FT)RGANIC VAPOR (PPM)
----------------------------------------	---------------------------------------

DESCRIPTION OF SUBSURFACE MATERIALS

s	URFACE -	Crass	
	3	330	1.0-3.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH HYDROCARBON ODOR). HIT TANK AT APPROXIMATE DEPTH OF 6 FEET, OFFSET BORING 3 FEET EAST. SAMPLES BELOW
5_			3 FEET IN DEPTH ARE FROM OFFSET BORING. 3.0-8.0 CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
10	8	202	8.0-13.0 CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
151	. 13	1 36	:3.0-18.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT TO FIRM (WITH TRACES OF CARBONIZED WOOD AND SLIGHT HYDROCARBON ODOR).
	18	8	18.0-20.5' CLAYEY SILT, LIGHT GREYISH BROWN GRADING TO GREY, MOIST, FIRM.
20	20.5	3	20.5-23.0' SILTY CLAY, DARK GREYISH BROWN GRADING TO DARK BROWN, MOIST, STIFF.
	23	2	23.0-27.0' CLAYEY SILT, BROWN, VERY MOIST, FIRM TO STIFF
<u>43</u>	25.5	6	27.0-28.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, FIRM.
 30			DISCONTINUED BORING AT 28.0 FEET.

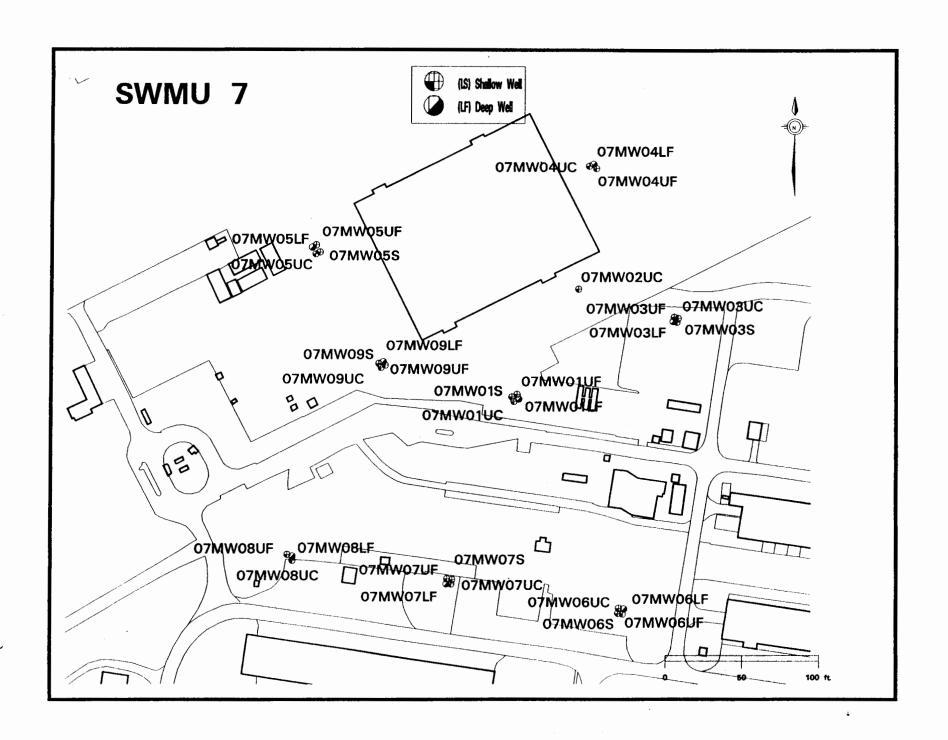


ENVIRONMENTAL ASSESSMENT REPORT NAS MEMPHIS CTO-0080

SOIL BORING B-15 UST's 304 & 1239 MILLINGTON, TN

DATE INSTALLED: 7/13/1994 PROJ. #: CTOOD

DATE: 8/4/1994



ENSIFE ©							©		Monitoring Well	07-	-MW-1S
	Environmental & Safety Designs, Inc.						De	signs, Inc.			
Pro	Project: NAS Memons								Location Manglon TN SWALK	7 - Bu	ding N-126
Pro	Project No.: ACCOM								Surface Elevation: feet inst		
Sta	ried at	106	an 2-	07-90	5				TOC Elevation: feet insi		
Con	pleted	at a	02-0	7-95					Depth to Groundwater: feet		Measured
Drie	ng Met	hort	Rotas	~				·	Groundwater Elevation: leet ms/		
	ng Com				Contra				Total Depth: 20.0 feet		
	logst:					¥			Hel Screen: 10 to 20 feet		
DEPTH INFEET		ANATICAL		* RECOVERY	(wdd) Cit	GRAPHIC LOG	SOR CLASS	GEOL(OGIC DESCRIPTION	ELEV. (11-ma)	WELL DIAGRAM
5- 10- 25- 35-			3	100	8G	9	ML	Clayey silt, modera Clayey silt, modera brown, mottled pai Clayey silt, light br dry.	rown to reddish brown, stiff, ste brown, stiff. ken from the boring for the		0.01 slot, PVC screen
40-											

Monitoring Well 07-MW-IUF Environmental & Safety Designs, Inc. Project: NAS Memoris Location: Mington, TN SWNUNT - Building N-128 Project No.: NO094 Surface Devators feet mal Started at 105 on 2-07-96 TOC Elevation: feet msl Completed at on 2-07-95 Depth to Groundwater: feet Measured Orling Method: Rotasanic Groundwater Elevation: feet msi Driling Company: North Star Driling Total Deoth: 40.0 feet Geologist: Ben Brantley Well Screen: 29 to 39 feet GRAPHOC LOG ANN YTEM SAMPLE SWALEND X RECOVER SOIL CLASS PTD COM GEOLOGIC DESCRIPTION WELL DIAGRAM MFEET ELEY. (Clayey silt, grayish blue green, moist. 80 86 Clayey silt, moderate brown, medium stiff. 2" 10, Sch. 40 PVC and 8" steel casing Clayey silt, moderate brown to dark yellowish brown, mottled pale yellowish brown. 15 100 86 Clayey silt, light brown to reddish brown, stiff, 20 Clayey silt, moderate brown, stiff. 25 3 100 86 Clayey sand, fine to medium, dark yellowish brown to light brown. 30 0.01 slot, PVC screen 10/20 sand 35 4 95 86

ENSIFE Monitoring Well 07-MW-1LF Environmental & Safety Designs, Inc. Project: NAS Memoris Location: Hillington, TN SHAW17 - Building N-126 Project No.: NOO94 Surface Elevations feet and Started at 105 on 2-07-95 TOC Devators feet Inst Completed at on 2-07-95 Depth to Groundwater: feet Heasted Orling Method Rolasonic Groundwater Elevation: feet mail Draing Company: North Star Draing Total Depth: 70 feet Geologist Ben Brantley Hell Screen: 59 to 69 feet ANUTTECA. SWALE GRAPHIC LOG X RECOVER SWALEND 50 CO GEOLOGIC DESCRIPTION WELL DIAGRAM 10, Sch. 40 PVC and 8" steel casing 45 Gravelly sand, coarse, grayish orange to yellowish orange. 5 55 90 BG 60 0.01 slot, PVC screen 10/20 send 65-Log information taken from the boring for the 70-Cockfield well at SWMU#7 site t 75-6 87 86 80

ENSIFE © Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-IUC

Project: NAS Memoris	Location: Milington, TN. Building N-126				
Project No.: NO094	Surface Elevation: feet its/				
Started at 106 on 2-07-96	TOC Elevation: feet mai				
Completed at on 2-07-95	Depth to Groundwater: feet Measured:				
Orling Method: Rolasonic	Groundwater Elevations feet mail				
Orling Company: North Star Drling	Total Depth: IIO.O feet				
Geologst: Ben Brantley	Well Screen: 97 to 107 feet				

060	~~~~	301	3 a lu	-				Ma datat or to lar reti		
OBTH NFEET	LITHOLOGIC	ANALYTICAL	SAFLEND	X PECOVERY	PTD (spm)	GRAPHOC LOG	SOR CLASS	GEOLOGIC DESCRIPTION	B.EV. (II-mal	WELL DIAGRAM
10- 15- 20-	\bigvee	***	1 2 3 4 5 6 8 9 10 11 12 13 14	80	146 89.4 55 9.1 6.3 2.9 24.8 12.3 0.3 86 86	nus	ME.	Clayey silt, moderate brown, medium stiff. Clayey silt, moderate brown to dark yellowish brown, mottled pale yellowish brown. Clayey silt, light brown to reddish brown, stiff, dry. Clayey silt, moderate brown, stiff.	378	7" ID, Sch. 40 PVC and 8" steel casing """"""""""""""""""""""""""""""""""""
30- 35-	X		15 16 17 18 19	95	86 86 86 86 86		sc			

EN SUFE ®

Monitoring Well 07-MW-IUC

E	Environmental & Safety Designs, Inc.							signs, Inc.	01	1911 100		
1		VAS M	_			<u> </u>			Location: Mington, TN. Building N-126			
Pro	ect N	o: NO	294			-	• • • • • • • • • • • • • • • • • • • •	Surface Elevation: feet insi				
		105			5			TOC Elevators feet mal	<u> </u>			
Con	pletec	at a	12-0	7-95				Depth to Groundwater: feet				
		thoat i						Groundwater Elevation: feet in	<u>'</u>			
		pary:			Onlin	9		Total Deptit: #0.0 feet				
Geo	ogst	<i>B</i> en t	rand	<u> </u>	γ			Well Screen: 97 to 107 feet	T	<u> </u>		
DEPTH INFEET	LITHOLOGIC	ANLYTICAL SAMPLE	SMALEND	X PECONERY	PID (tron)	GRAPHOC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (N-med	HELL DIAGRAM		
45-			21 22 23 24 25 26		86 86 86 86		SC	Gravelly sand, coarse, grayish orange to		#0 PvC and 8" start casing ————————————————————————————————————		
55-			27	90	86	00		yellowish orange.		- Dunio		
60-		•	29 30 31 32		0.8 LO 0.8	00000000	¢ GP	•		Sch. 40 PVC and 8" steel casing		
65-			33		0.8	0				- 2" 10, Sch.		
	M		34 35		0.8 B6	0	. —	Sand clayey, fine, pale yellowish orange to				
70-	$/ \parallel$		36		86			moderate orange. Sity clayey sand, fine, medium gray to olive				
75-			37 38	87	86		sc	gray, contains marcasite nodules.		miniminiminiminiminiminiminiminiminimin		
	\bigvee		39	5 ,	86			Sand, fine, yellowish gray to light gray, lighte at 79.5°.				
80	\triangle		40		86							

Environmental & Safety Designs, Inc.									Monitoring Well	07-	MW-IUC		
Pro	ect: /	WSM		3					Location: Milington, TN Building N-126				
Pro	ect N	a: NO	094				•		Surface Elevation: feet asi				
Sta	ned a	1 106	on 2-	07-9	5				TOC Elevation: feet mal				
Сап	plete	sat o	n 2-0	77-95					Depth to Groundwater: /eet		Measured		
Dri	ng Mel	hod	Rotas	anc					Groundwater Elevation: feet auf				
Orling Method: Rotasonic Orling Company: North Star Driling									Total Deptit: IIQO feet				
Geologist: Ben Brantley									Well Screen: 97 to ID7 feet				
OEPTH INFEET	2 2 2 2 2 2 2								SIC DESCRIPTION	ELEV. (M-mat)	WELL DIAGRAM		
			41		86	33		Sand, fine, measur gr	ray to cave gray,				
	N /] "		60	5.5		Ricaceous.					
1.	N /	İ	42	}	BG	0.0				'	9		
	IVI	1				33	1						
85-	W	l	43	i	86			Sand fine Eacht afive	e gray to gray with dusky		T 88 7		
1	V	ł	l	1	1		1	brown clay lenses.	- A-mi to A-mi with CANA		goul		
	Y		44		86	(2)	1				2" ID, Sch. 40 PVC and 8" steel casing — """""""""""""""""""""""""""""""""""		
						23.3							
	1Λ :	,	45		86						2 8		
90-	I/Λ			ļ			i						
	V V		46	1	86	34					h. 40 Pr		
	/ \			i		7.7	sc				S 4		
1	/ V		47		86						g 🕶		
~			48			7.7	}				- I		
95-			10	110	86	777	ł						
	K /		49		BG	7.7				}			
	1		70	ļ			i				T B		
	\ /		50	ļ	86	77	•	Cama na mbawa bud :			E E		
100-	M		**				Ì	from 99' to 105'.	increasing amounts of clay	ļ			
	M		51	1	86		}			1	0.01 stot, PVC scre		
	V			1	1		l				[] 2		
1	٨		53	1	86	22	ł						
					1		1						
105-	$I \setminus I$		54	1	86	iiii		Clay wary dueby he	rown, hard, has olive gray	1	· 且		
1	/ \H			Į				sand lenses.	100 W 100 OHE \$ 69				
1	/ \l		55	1	86		CL			1			
1	/ V		58		86								
110-			57	100	88								
[~]			-	~~	1			End of boring at 110"	•]			
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150-		.									j		

Monitoring Well 07-MW-2S Environmental & Safety Designs, Inc. Project: NAS Memoris Location: Hillington, TN SHMUNT - Building N-28 Project No.: NOO94 Surface Elevation: feet insi Started at on 2-07-95 TOC Devation: feet inst Completed at on 2-07-95 Measured Depth to Groundwater: feet Drilling Method: Rotasonic Groundwater Elevation: feet and Driling Company: North Star Driling Total Depth: 20.0 feet Geologist: Ben Brantley Well Screen: to feet ANALYTICAL SAMPLE QASS X RECOVER 8 GEOLOGIC DESCRIPTION WELL DIAGRAM DEPTH INFEET EP. 42" 10, Sch. 40 PVCM Clayey silt, grayish green with dark yellow ١ 90 86 0.01 slot, PVC screen Clayey silt, dark yellowish brown to light olive 2 100 86 Clayey silt, dark yellowish orange to light brown, medium stiff, dry. 20 3 100 86 Clayey sit, moderate brown with organics. End of boring at 20'. 25. 30-35-40

Enviro		ntal 8			De	signs, Inc.	Monitoring Well	07-	MW-2UC	
Project: NA	AS Memo	2715					Location: Milington, TN SHAUBT - Building N-126			
Project No.							Surface Elevation: feet mal			
Started at							TOC Elevation: feet mai			
Completed							Depth to Groundwater: feet		Measured	
Orling Meth							Groundwater Elevation: feet risk			
Drilling Comp Geologist: &			Di	7			Total Depth: 25.0 feet			
	. [X PECONERY	PTD (pow.)	GRAPHOC LOG	SOL QASS	GEOL(OGIC DESCRIPTION	ELEV. (n-mad	WELL DIAGRAM	
20	2 3 4 5 6 7 8 9 10	100	86 86 419 20.0 86 86 86 86 86		ML.	Clayey sit, dark ye gray. Clayey sit, dark ye medium stiff, dry. Clayey sit, modera	ellowish brown to light olive ellowish orange to light brown, ste brown with organics.		2* 10, Sch. 40 PVC and 8* steet casing	
30-	13		86 86			medium stiff, fine.	•			
~7 / 1	15		86							
1/\1	~		50	바	GM	CM electric enc 4	nadium bening to summer date			
#/ \l	16		86			orange, a few small	necium, brown to yellowish I gravels.			
₩						4 -, 3	•			
35	17	80	86	1						
1\ /1				ipp			•			
1 X I	18		86	100						
40	10		86	0	GP	Sand, medium, yello micaceous.	wish gray to grayish orange,			

Ersufe ®

Monitoring Well 07-MW-2UC

Environmental & Safety Designs, Inc.								• • .	Monitoring Well 07-MW-2UC			
	:NYII	OUL	ent	al 6	Sa	fety	De	signs, Inc.				
		WS M							Location Mington, TN. SMMLN17 - Building N-28			
		x: NO		<u> </u>				····	Surface Devators feet mal			
	Started at 150 on 2-07-95 Completed at on 2-07-95								TOC Devator: feet inst			
	Driling Method: Rolasonic								Depth to Groundwater: feet Groundwater Elevation: feet insi		Measured	
	_	Dary.			r Onlin	0			Total Depth: 25.0 feet			
		8en l							Well Screen: 108 to 118 feet			
						9				7		
DBTH NFEET	LITHOLOGIC	ANN YTICAL SAMPLE	SWALEND	X RECOVER	5 50	GRAPHOC LOG	SOBL CLASS	G€OL:	OGIC DESCRIPTION	BLEV. (N-m	WELL DIAGRAM	
			20		BG	Ve						
	N /		-~			70				ļ		
			21		86	N C						
٠	M					0		ĺ				
45-	W		22		86	V				ļ		
	23 86 0					6						
•						2						
	$ \Lambda $	24	Be U	0			velly, grayish orange to dark					
50-	50-		25		86	0		yellowish orange,	gravels up to 2" in diameter.	}		
	$I \setminus V$		23		60	03						
	$I \setminus V$		26	İ	86	0				l		
						0 3				ļ	Trimminiminiminiminiminiminiminiminiminim	
55-			27	87	B6	0				1		
			28		86	0 9				•	PVC and 8" steel casing	
						0			•	1		
	\ /		29		86	V a				}	Du II	
60-	MI		30		86	0	GP				VC and	
]	M		~		86	V_9					9	
	V		31		B6	0					1 6 8 8	
	V	-	• •]		1 9					7 10, Sch. 4	
65-			32		86	03						
	Λ		33		86	O						
1	M				l	0 4		•				
			34		86				•			
70-	/ 11		35	ļ	86	0 4						
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			36		86	10 4						
						0	,			1		
75	\Box		37	90	BG	0 9			ay to pale yellowish orange,			
]	\bigvee		į	1		701		with light gray cla	y ænises.	1		
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	/ \					0						
80-		ļ				1						

Monitoring Well 07-MW-2UC Environmental & Safety Designs, Inc. Project: NAS Memoris Location Mington, TN SHALW7 - Building N-28 Project No.: A0094 Surface Devators feet mal Started at #50 on 2-07-95 TOC Elevation: feet insi Completed at on 2-07-95 Depth to Groundwater: feet **Heasured** Orling Method: Rolasonic Groundwater Elevation: feet msf Orling Company: North Star Driling Total Depth: 25.0 feet Hell Screen: 106 to 118 feet Geologist: Ben Brantley GRAPHIC LOG AWLYTICAL X RECOVER SOL CASS SWALEND 70 ton GEOLOGIC DESCRIPTION WELL DIAGRAM DEPTH NFEET 0 Silty sand, fine, light olive gray to grayish brown, conatains dusky brown clay lenses. 85 2" 10, Sch. 40 PVC and 8" steel casing 90 95 90 BG Lignite laminations from 94'-95'. Marcasite present at 98'. SM 100 105 0.01 slot, PVC screen 110-115 95 8G Clay, dusky brown, hard, waxy, with thin sand laminations. OL.

Monitoring Well 07-MW-2UC Environmental & Safety Designs, Inc. Location: Mington, TN SHALMT - Building N-128 Project: NAS Hemphs Project No.: NOOS4 Surface Devators feet as Started at #50 on 2-07-95 TOC Elevation: feet msi Completed at an 2-07-95 Measured Depth to Groundwater: feet Orling Method: Rotasano Groundwater Elevation: feet mist Orling Company: North Star Driling Total Depth: 25.0 feet Geologist: Ben Brantley Well Screen: 106 to 116 feet ELEV. (N-mat) AWLYTICAL SAMPLE QASS X RECOVER 70 CO WELL DIAGRAM GEOLOGIC DESCRIPTION 125 10 90 86 End of boring at 125. 130 135 140 145-150 155-

[Envir	onm	Entent	al &	Sai	FE	© De:	signs, Inc.	Monitoring Well	07-	-MW-3S
	ect: A								Locations Mington, TN SHAW	7 - Buk	ing N-26
	ect No								Surface Elevation: feet mal		
	rted at			-07-9	5				TOC Elevations feet mal		
Con	Deted	at 5	00 an	2-11-	95				Depth to Groundwater: feet		Measurect
Drs.	ng Meti	hoct	Rotas	anc					Groundwater Elevations feet ma		
	ng Com			_	Onling	2			Total Depth: 200 feet		
Geo	togst	Ben I	8 anu	Ey					Hel Screen: 10 to 20 feet		
OSPTH NFEET	LITHOLOGIC	AWLYTICAL SAMLE	SWALEND	X RECOVERY	PTD (tron)	GRAPHOC LOG	SOL CLASS	GEOL(OGIC DESCRIPTION	ELEV. (N-mod	WELL DIAGRAM
5 10 20-			2	40 120 100	86 86		ML	yellowish brown, mo			
25-		•						Cockfield well at S			
30-				·							·
35-											
40-											

Monitoring Well 07-MW-3UF

Environme	ental &	Saf	ety	Des	signs, Inc.			
Project: NAS Men	D/IS	-	<u>_</u>			Location Minglon TN SHAUN	- Buidi	ng N-26
Project No.: NOOS						Surface Elevation: feet inst		
Started at 1630 or						TOC Devation: feet insi		
Completed at 500	on 2-4-	95				Depth to Groundwater: feet		Heasured
Orling Method Ro						Groundwater Elevations feet inst		
Drilling Company: /		Drang				Total Depth: 45.0 feet		
Geologist: Ben Bra	anuley					Hel Screen: to feet		
OPTH INFEET LITHOLOGIC SAMPLE AMLYTICAL SAMPLE	SAPLE NO. X PECONERY	PID (spm)	GRAPHOC LOG	SOR GASS	ŒŒŒ	OGIC DESCRIPTION	ELEV. (ft-med)	WELL DIAGRAM
20	1 40 2 120 3 100 5 90 6 100 7 100	86		SC SC	Clayey silt, olive by Clayey silt, modern organics. Clayey silt with sa Silty clayey sand, brown.	ellowish brown, medium stiff. ate brown with yellow gray silt, and, moderate brown. yellowish orange to yellowish sh orange to reddish brown,	63	The send — Supplies seed
40-	8 150	86	(4) (2) 					

Er Sufe ®

Monitoring Well 07-MW-3LF

Project: NAS Respiral Project No. ACCOUNT STATUTE CONTINUE STATUTE CONTINUE NO. ACCOUNT STATUTE CONTINUE NO. ACCOUNT STATUTE CONTINUE NO. ACCOUNT STATUTE CONTINUE NO. ACCOUNT STATUTE CONTINUE NO. ACCOUNT STATUTE CONTINUE NO. ACCOUNT STATUTE CONTINUE NO. ACCOUNT STATUTE CONTINUE NO. ACCOUNT STATUTE CONTINUE NO. ACCOUNT STATUTE CONTINUE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOUNT STATUTE NO. ACCOU	E	Envir	onm	ent	3 ls	Saf	et	y	Des	signs, Inc.	1101111011119 11011	•	
Project No. A0004 Started at 150 on 2-07-95 Competed at 500 on 2-17-95 Deby to Groundwater feet met Dring Nethod: Rotsonic Dring Nethod: Rotsonic Dring Nethod: Rotsonic Dring Company. North Star Dring Geologist: Cere Railburg Med Screen; 69.5 to 79.5 feet Surgan Started at 500 on 2-17-95 Geologist: Cere Railburg Med Screen; 69.5 to 79.5 feet Surgan Started at 500 on 2-17-95 Geologist: Cere Railburg Med Screen; 69.5 to 79.5 feet Surgan Started at 500 on 2-17-95 Geologist: Cere Railburg Med Screen; 69.5 to 79.5 feet Geologist: Cere Railburg Geologist: Cere Railburg Med Screen; 69.5 to 79.5 feet Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Railburg Geologist: Cere Rail	Pro	ect: /	USH	נויסויי			_	<u> </u>			Location Mington TN SHALE	- Buk	ng N-28
Completed at 500 on 2-M-96 Despit to Groundwater: feet Measured Groundwater Elevator: feet as Despit to Groundwater: feet Groundwater Elevator: feet as Dring Company: Abort Star Ording Geologic: Ben Brantley Mell Screen: 69.5 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet GEOLOGIC DESCRIPTION Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 35 to 79.5 feet Mell DIAGRAM Total Ben's 3	Pro	ect No	: NO	294									
Competed at 500 on 2-M-95 Drilling Method Rokasons Drilling Company: Natrit Star Drilling Geologist: Ben Brantley Method Book Star Drilling Geologist: Ben Brantley Method Book Star Drilling Geologist: Ben Brantley Method Book Star Drilling Geologist: Ben Brantley Method Book Star Drilling Geologist: Ben Brantley Method Book Star Drilling Geologist: Ben Brantley Method Book Star Drilling Geologist: Ben Brantley Method Book Star Drilling Geologist: Ben Brantley Method Book Star Drilling Geologist: Ben Brantley Method Book Star Drilling Geologist: Ben Brantley Method Book Star Drilling Geologist: Ben Brantley Method Book Star Drilling Method Book Star Drilling Geologist: Ben Brantley Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method Book Star Drilling Method	Sta	rted a	630	on 2-	07-9	5					TOC Elevation: feet inst		
Drilling Company: North Star Drilling Geologist: Birth Grantery Well Screen: 89.5 to 79.5 feet Well Screen: 89.5 to 79.5 feet Well Screen: 89.5 to 79.5 feet Well Screen: 89.5 to 79.5 feet Well Screen: 89.5 to 79.5 feet Well Clayer sit, societate brown to anoderate yellowish brown, a cirst. 10 2 120 86 W. Clayer sit, olive black, acirst, soft. Clayer sit, dark yellowish brown, medium stiff. Clayer sit, dark yellowish brown, medium stiff. Clayer sit, moderate brown with yellow gray sit. Clayer sit, moderate brown with yellow gray sit. Clayer sit, moderate brown with yellow gray sit. Clayer sit, moderate brown with yellow gray sit. Clayer sit, moderate brown with yellow gray sit.	Con	pietec	at 5	20 an	2-H-	96							Measured
GEOLOGIC DESCRIPTION THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE	0.5	ng Met	hoct /	Potas	onc						Groundwater Elevations feet mal		
Security of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the st	Dre	ng Cor	noany.	Nort	n Star	Orang	7_				Total Depth: 80.0 feet		
SOUND STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE	Geo	logst:	Ben 6	3ranu	y						Well Screen: 69.5 to 79.5 feet		
Clayey salt, moderate brown with yellow gray salt, organics.	OGPTH INFEET	LITHOLOGIC	ANALYTICAL SAMPLE	SWELEND	X PECOVERY	PTD (spen)	20120	Growner Little	SOL CLASS	ŒŒ	OGIC DESCRIPTION	٤	HELL DIAGRAM
	5 20 25		₹ S	3 . 4	40 120 100 90	86 86 86			ML.	Clayey sit, olive b Clayey sit, dark y Clayey sit, moder organics. Clayey sit with sa Sity clayey sand, brown. Sity sand, yellowi	whack, moist, soft. Tellowish brown, medium stiff. The brown with yellow gray sait, The brown with yellow gray sait, The brown with orange to yellowish The brown,	3	Sc.

		4	E	75		FE	•		Monitoring Well	07-	MW-3LF
	_				Sa	tety	Des	signs, Inc.			
	ect N								Location: Minglon, TN SHAU	17 - Bul d	hg N-28
	ect No			07-0					Surface Devators feet mal		
	pieted							· · · · · · · · · · · · · · · · · · ·	TOC Elevation: feet mal Depth to Groundwater: feet		Heasted
	ng Met								Groundwater Elevation: feet #5	1	768064
	ng Com				Online	,			Total Depth: 80.0 feet		
	logist	_							Well Screen: 69.5 to 79.5 feet		
OEPTH INFEET	SAPLE SAPLE	ANLYTICAL SAPLE	ON FLANS	% RECOVERY	(wota) CELA		SOUL CLASS	G€OL(OGIC DESCRIPTION	ELEV. (N-mad	WELL DIAGRAM
	\ /					11	SC			1	
45-	X		9	120	86	000000		brown.	wish orange to yellowish parse, grayish orange to		
50- 55-	\bigvee		10	75	86	0000000000	GP				2" ID, Sch. 40 PvC and 8" steel casing ————————————————————————————————————
65-	\bigvee	-	п	80	86	00000000					2 10
75-			צ	80	86	000000	SC	Sitty sand, fine, ye	flowish orange to yellow gray.		### 0.01 slot, PVC screen — [[11]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]

Monitoring Well 07-MW-3UC Environmental & Safety Designs, Inc. Project: NAS Memoris Location: Mington TN SWMLW7 - Building N-128 Project No.: NO094 Surface Elevation: leet mil Started at 1630 on 2-07-96 TOC Elevation: feet inst Completed at 1500 on 2-14-95 Depth to Groundwater: feet Measurect Orang Method: Rotasanic Groundwater Elevation: feet inst Total Depth: #5.0 feet Orling Company: North Star Driling Well Screen: 97 to 107 feet Geologist: Ben Brantley GRAPHIC LOG ANNETICAL SMALE CITHOLOGIC SWALEND X RECOVER 3 WELL DIAGRAM GEOLOGIC DESCRIPTION 2 Clayey sit, moderate brown to moderate yellowish brown, moist. BG 2 86 5 40 3 BG 86 10 5 120 86 86 8 40 PVC and 8" steel casing 7 86 100 ML Clayey sit, olive black, moist, soft. ٥ 86 10 86 Clayey silt, dark yellowish brown, medium stiff. 20 11 90 86 12 **8**G SCF Ö 13 86 25 90 Clayey sat, moderate brown with yellow gray sat. 14 86 organics. 15 86 30 100 **B6** 16 Clayey silt with sand, moderate brown. 17 86 Sity clayey sand, yellowish orange to yellowish prown. 18 86 35 100 SC

Sity sand, yellowish orange to reddish brown,

fine to medium grained.

86

86

8G

120

20

Monitoring Well 07-MW-3UC Environmental & Safety Designs, Inc. Project: NAS Memoria SHALM7 - Building N-128 Location Mington TN Project No.: NO094 Surface Devators feet as Started at 1630 on 2-07-96 TOC Elevation feet may Completed at 500 on 2-14-95 Measured Depth to Groundwater: feet Orling Method Rolasonc Groundwater Elevation: leet mail Drilling Company: North Star Drilling Total Depth: 150 feet Geologist: Ben Brantley Well Screen: 97 to 107 feet ANKYTICA SAFIE GRAPHOC LOG UTHOLOGIC SAPPLE SOIL GLASS SAPLEND έ 3 WELL DIAGRAM GEOLOGIC DESCRIPTION N-FEET £ 0.2 SC 22 Sand, yellowish gray, fine. 23 0.2 Sand, medium, yellowish orange to yellowish 45 8G 24 120 Sand, medium to coarse, grayish orange to yellow gray, with gravels. 02 1 25 O 0.2 26 O 50 0.2 27 28 86 2" ID, Sch. 40 PVC and 8" steel casing 55 29 75 86 30 BG Ø 86 GP 60 32 86 O 33 86 65 34 80 86 7 35 86 36 86 70-37 86 0.2 38 **75** 30 80 0.2 O 40 86 Sity sand, fine, yellowish orange to yellow gray. 86 SC 80 CL.

Monitoring Well 07-MW-3UC Environmental & Safety Designs, Inc. Project: NAS Memphs Location: Mington, TN SWALWT - Building N-26 Project No.: NO094 Surface Devators leet ms/ Started at 1630 on 2-07-95 TOC Elevation: feet fist Completed at 1500 on 2-14-95 Depth to Groundwater: feet Measurect Orling Method: Rotasano Groundwater Elevation: feet mil Orling Company: North Star Orling Total Depth: #5.0 feet Geologist: Ben Brantley Well Screen: 97 to ID7 feet GRAPHEC LOG SMALE LITHOLOGIC ANN TIEN SAPPLE QASS SWALE NO. έ 8 GEOLOGIC DESCRIPTION WELL DIAGRAM Clay, dusky brown to olive gray, with light gray 42 86 sand 43 2" ID, Sch. 40 PVC and 8" steel casing BG 85 105 BG 45 **8**6 48 90 47 86 Lignitic from 91'-93'. 48 **B6** 95 105 86 50 86 51 **B6** 0.01 slot, PVC screen 100-52 BG 53 86 105 100 86 Clay, dusky brown, waxy, contains less sand. 55 86 58 86 110-57 **B**6 58 86 115 BG 110 End of boring at 115". 120

EN SUFE

Monitoring Well 07-MW-4S

1 8	Envir	onm	ent	3 la	Sat	fety	Des	signs, Inc.	Monitoring wen	O i	1111 TO
	rect: A								Location Mington TN SHMUM	- Buk	ing N-26
	JECT NO					-			Surface Elevation: feet mal		
	rted at				-				TOC Elevation: feet ms/		
Con	peted	at O	210 an	2-16-	95				Depth to Groundwater. Icet		Heasured
O	ng Met	hod /	Rolas	onic					Groundwater Elevation: feet mal		
	ng Con				Online	2			Total Depth: 20.0 feet		
Geo	dogst	Jack	Cama	chad!		,		,	Well Screen: 10 to 20 feet		
DEPTH INFEET	UTHOLOGIC SAPPLE	ANNETE SAME	SAPLEND	* RECOVERY	70 (spm)	GRAPHIC LOG	SOL QASS	G€OL(OGIC DESCRIPTION	ELEV. (N-md	HELL DIAGRAM
5- 10-			2	62.5 50			ML	Clayey silt, modera Clayey silt, dark y moist.	elow brown, medium stiff,		0.01 slot, PVC screen — — — — — — — — — — — — — — — — — —
20-	Å		4	80	86			hard.	ken from the boring for the WMU#7 Site 4.		
25-		-									
30-											
35-									•		
40-											

• Monitoring Well 07-MW-4UF Environmental & Safety Designs, Inc. Location: Mington, TN SHAUM7 - Building N-26 Project: NAS Memoris Project No.: NOO94 Surface Elevation: feet mail Started at 0900 on 1-09-95 TOC Devauore feet mail Completed at 0910 on 2-15-95 Measured Depth to Groundwater: feet Drilling Method: Rotasonic Groundwater Elevation: feet mil Total Depth: 450 feet Driling Company: North Star Driling Well Screen: 35 to 45 feet Geologist: Jack Carmichael GRAPHOC LOG ANNLYTICAL SAFRE QASS X RECOVER SWALEND 70 ton GEOLOGIC DESCRIPTION WELL DIAGRAM COSTA INFEET 8 Clayey sit, moderate brown, stiff. 82.5 BG 10 50 2 86 2" 10, Sch. 40 PVC and 8" steel casing ML 60 86 Clayey silt, dark yellow brown, medium stiff, moist... Clayey silt, moderate yellow with reddish brown, 20 80 86 25 80 86 Clay, sity, trace sand, very fine, moderate reddish brown, stiff. Sand, clayey, silty, finely micaceous, moderate reddish orange to moderate reddish brown. 30-SC 35 BG 110 Sand, very fine to fine, silty, clayey, laminated, small clay casts, pale orange to moderate red.

		Onn	ent			F	De	signs, Inc.	Monitoring We				
	rect: /								Location Hillington, TN SHA	UP7 - BJK	ing N-1	26	
	ect N			-					Surface Elevations feet mail				
	rted a								TOC Devators feet mal				
_	peter				-50				Depth to Groundwater: feet		Meas	red	
	ng Mel								Groundwater Elevations feet	RS/			
	ng Con dogst				Onen	<u>g</u>			Total Depth: 45.0 feet Net Screen: 35 to 45 feet				
NFEET	UPPOLOGIC SAPLE				PTO (DDM)	GRAPHOC LOG	SOL CLASS	GEOLG	OGIC DESCRIPTION	ELEV. (n-mal)	HE	ELL DIAGRA	W
45-			7	105			sc		fine, silty, some clay, dark grayish orange, wet.				- 10/20 send
								Log information tal Cockfield well at S	ten from the boring for the MMU#7 Site 4.				
50-													
55-													
80-					÷							•	
es-		•											
70-								·					
75-													
80-													

Monitoring Well 07-MW-4LF Environmental & Safety Designs, Inc. Project: NAS Memoris Location: Mington, TN SWALM7 - Building N-128 Project No.: NOOS4 Surface Devators feet inst Started at 0900 on 1-09-95 TOC Elevation: feet mal Completed at 0910 on 2-15-95 Depth to Groundwater: /eet Deves Orling Method: Rotasonic Groundwater Elevation: feet inst Draing Company: North Star Draing Total Depth: 70.0 feet Hel Screen: 60 to 70 feet Geologist: Jack Carmichael GRAPHIC LOG UTHOLOGIC SWALE AWLYTICAL SAFRE QASS SWELEND X RECOVER Ę 3 HELL DIAGRAM GEOLOGIC DESCRIPTION DEPTH NFEET Ę Clayey silt, moderate brown, stiff. 62.5 BG 50 BG 2 10, Sch. 40 PVC and 8" steel casing 15 3 60 BG Clayey silt, dark yellow brown, medium stiff, moist_ Clayey sit, moderate yellow with reddish brown, hard. 20 80 86 25 5 80 86 Clay, salty, trace sand, very fine, moderate reddish brown, stiff. Sand, clayey, silty, finely micaceous, moderate reddish orange to moderate reddish brown. 30 SC 35 8 110 BG Sand, very fine to fine, silty, clayey, laminated, small clay casts, pale orange to moderate red.

	Envir	onm	Ent.	al &	Sat	FE	De	signs, Inc.	Monitoring Wel	07-	-MW-4LF
	ect A				-			319110, 1110.	Location Mington, TN SHAU	47 - D.A	MA-06
	ect No			,					Surface Devation: feet #sl	7 - 500	J. J. J. J. J. J. J. J. J. J. J. J. J. J
	rted a			-00-0	<u> </u>				TOC Elevation: leet as/		
	noieted								Depth to Groundwater. /eet		Measured
	ing Met								Groundwater Elevation: feet ma		readed
	ng Con	_			Onlin				Total Depth: 70.0 leet		
	ologist	_			-	<u>y</u>		 	Hell Screen: 80 to 70 feet		
OBTH INFEET	UTHOLOGIC SAMPLE	AMLYTICAL SAMPLE		X PECONERY	PIO (topa)	GRAPHIC LOS	SOIL CLASS	GEOL	OGIC DESCRIPTION	ELEV. (N-mad)	WELL DIAGRAM
45-	\bigvee		7	105	BG		sc	· ·	fine, säty, some clay, dark o grayish orange, wet.		ing ————————————————————————————————————
50-	\bigvee					0000		Sand, gravelly, cla moderate yellowish	ly balls, grayish orange to h brown.		2" ID, Sch. 40 PVC and 8" steel casing ————————————————————————————————————
5 5 -	\bigvee		8	100	86	0000000	6P	Sand with gravel, to moderate yellor	fine to coarse, grayish orange wish brown, wet.		2° 10, Sch. 40 PVC and 8° steel casing
85-	\bigvee	,	9	100	86	300000		Gravel, sandy, no yellowish orange.	derate yell owish brown to dark		
70- 75-			10	100	86			Log information ta Cockfield well at S	ken from the boring for the SHHU#7 Site 4.		

◉ Monitoring Well 07-MW-4MC Environmental & Safety Designs, Inc. SHALW7 - Building N-26 Project: NAS Hemons Location: Milington, TN Project No.: NOO94 Surface Devators feet msi Started at 0900 on 1-09-95 TOC Elevation feet as Completed at 0910 on 2-16-95 Measured Depth to Groundwater: feet Orling Method: Rotasanic Groundwater Elevation: feet ms/ Drilling Company: North Star Drilling Total Deptir MSO feet Hel Screen: 28 to 138 feet Geologist: Jack Carrichael TE E GRAPHIC LOG ANNLYTICAL SAPRE **CASS** LITHOLOGIC X RECOVER P10 (spa.) HELL DIAGRAM GEOLOGIC DESCRIPTION OBPTH NFEET BE. Clayey sit, moderate brown, stiff. 86 BG 3 62.5 BG BG 5 86 **B6** Ю 50 **B**6 ML 86 ID, Sch. 40 PVC and'B" steel casing 60 15 Clayey sit, dark yellow brown, medium stiff, 86 86 Clayey silt, moderate yellow with reddish brown, 20 80 86 BG 12 25 IJ 80 86 Clay, sity, trace sand, very fine, moderate reddish brown, stiff. 14 86 Sand, clayey, sity, finely micaceous, moderate reddish orange to moderate reddish brown. 86 30 86 17 **B6** SC 35 18 110 BG Sand, very fine to fine, sitty, clayey, laminated, small clay casts, pale orange to moderate red. 86 20 BG

	Envir	onm	Ent	al &	Sa	FE	De:	signs, Inc.	Monitoring Well	07-	-MW-4MC
	ect: /							3.10, 5.101	Location Allington TN SHALL	7 - Bulo	na N- 26
	ect No								Surface Elevations feet inst		
	rted a			-09-8	5				TOC Devator: feet msl		
	pletec								Depth to Groundwater: feet		Heasured
Dra	ng Met	hoct	Rotas	one:					Groundwater Elevation: feet ins		
	ng Con				Onlin	0			Total Deptit: 145.0 feet		
	logst								Hel Screen: 28 to 138 feet		
DEPTH INFEET	LITHOLOGIC	ANNLY TEAL	SMPLEND	X RECOVERY	PTD (trons)	GRAPHOC LOG	SOIL CLASS	ŒŒŒ	OGIC DESCRIPTION	ELEV. (N-mad	WELL DIAGRAM
	/		21		B G	33					
45-	X		22	105	B6 B6		sc		fine, silty, some clay, dark o grayish orange, wet.		THE PROPERTY OF THE SCH. 40 PVC and 8" steel casing ————————————————————————————————————
	\ /		24		86	0		Sand, gravelly, cla moderate yellowish	y balls, grayish orange to brown.		
	\bigvee		25		96	0					
50-	$ \Lambda $		28		86	700		·			
	$/\setminus$		27		86	0					
55-			28	100	86	200		Sand with gravel, it to moderate yellow	ine to coarse, grayish orange rish brown, wet.		el cesin
	$\setminus \mid$		30		86	000	GP				and 8" steet casing
60-	X		31		86	0					PVC an
	$/ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$		32		86	000					THE SCH. 40 PVC.
85~			33	100	B G	0		Gravel, sandy, soo yellowish orange.	lerate yellowish brown to dark		- 2- 10.
	\setminus / \mid		34		86	0					
70-	XI		35		86	v o		Sand vary fine in	fine, silty, clayey, laminated,	4	
	$/\!\!\setminus\!\!\! $		36		BG BG				to grayish brown, stiff,		
75-			38	100	86		SC	Sand, very fine to	fine with clay streaks, pale		
	\bigvee		39		86				n gray stained dark yellowish		
80	\triangle		40		86						



Monitoring Well 07-MW-4MC

	Envir	onm	ent	al &	Sa	fety	De	signs, Inc.	monitoring man	•	
	ect: /					<u> </u>			Location Mington, TN SWML	7 - B/c	ng N-28
	ect No								Surface Elevation: feet inst		
Sta	rted a	090	on t	-09-5	8				TOC Elevation: feet mal		
Con	pletec	at O	910 an	2-16-	-96				Depth to Groundwater: feet		Measured
	ng Met								Groundwater Elevation: feet ris		
	ng Co				Orin	9			Total Depth: 145.0 feet		
Geo	ogst 1	Jack	Cam	chael				r	Well Screen: 128 to 138 feet	T =	
DEPTH INFEET	LITHOLOGIC	ANALYTICAL	SAMPLEND	X PECOVERY	PID (trom)	GRAPHEC LOS	SOIL CLASS	GEOL(OGIC DESCRIPTION	ELEV. (ft-ma	WELL DIAGRAM
	1		41		86	16					
	X		42		BG			Sand yeary fine to	fine, with clay streaks,	1	
85-	$\langle \ \rangle$		43	100	BG				ery pale orange, stained dark		
	1			~	1			Sand, very fine to	fine, clayey, laminated, pale		
			44		86			brown to moderate Sand, very fine to	e brown, wet. fine, laminated, medium gray		40 PVC and 6" steel casing ————————————————————————————————————
90-	1 Y		45		86			to grayish brown,	with occassional lignite chips.		
	1/		46		86						
	$V \setminus$		47		86						
95-			48	100	BG						40 PVC and 8" steet casing
	Λ / I		49		86						• • • • • • • • • • • • • • • • • • •
100-	lVI		50		BG				ę		C and 8
	$ \Lambda $		51		BG		SC				O PVC
]/\		52		86						Sch. 4
105-	/		53		86						* 10, Sch.
			54	109	86	77					
	$ \backslash / $		55		86	99					
110-	X		58		86	99					
	$/ \setminus$		57		86						
115-			58	100	B 6			Sand, very fine to	fine, clayey with fignitic chips,		
	\bigvee		59		86				to grayish brown, clayey		
	\bigwedge		60		8 G						miniminiminiminiminiminiminiminiminimin
120-										1	I

			E	74	<u> </u>	FE	Θ		Monitoring Well	07-	-MW-4MC
1	Envir	OU	ent	al &	Sa	fety	De	signs, Inc.			
	ect /								Location: Mangion, TN SWALM	7 - Buk	ing N-128
	ect N								Surface Elevation: feet insi		
	rted a								TOC Elevation: feet inst		
	peter				· <u>ss</u>				Depth to Groundwater: feet		Measured
	ng Mei								Groundwater Elevation: feet msi		
	ng Cor xlogist:				U.	9			Total Deptir: 145.0 feet Well Screen: 128 to 138 feet		
DEPTH INFEET	LIHOLOGIC	3		X PECOVERY	(acc) Of	GRAPHOC LOG	SOL Q.ASS	GEOL(OGIC DESCRIPTION	ELEV. (N-ma)	WELL DIAGRAM
	V		61		86						Grout -
125-			63	100	86			,			or out
	Λ		84		BG						
130-	V		65		86						
130			66		86		SC				1, PVC screen
	V		67		86						0.01 slot, PVC screen
135-	\ /		68	150	86				fine, lignitic, light brownish own, cohesive in clayey zones,		- 0.01 slot, PVC screen -
	$ \bigvee $		70		BG			Lignitic, čusky bro	wn, hard.		
140-	$ \lambda $		71		86			1	of sand, laminated dark or changes below 141', stiff.		000
	$/\setminus$		72		86		CL				0000
145-			73	100	86			End of boring at 1	45'.		<u> </u>
150-											
155-											
160-									•		

Environmental & Safety Designs, Inc. Monitoring Well 07-MW-UF Location: Mington, TN SHMUNT - Building N-28 Project: NAS Memoris Surface Elevation: feet ms/ Project No.: NOOS4 Started at on 1-09-95 TOC Elevation: feet ms/ Completed at an 2-21-95 Depth to Groundwater: feet **Measured** Groundwater Elevation: feet msf Orling Method: Rotasano Total Depth: 45.0 feet Orling Company: North Star Driling Hel Screen: 35 to 45 feet Geologist: Jack Carrichael ANNLYTICAL SY70 K RECOVER SWALEND 3 HELL DIAGRAM GEOLOGIC DESCRIPTION ee. Ş Clayey silt, moderate brown to yellowish brown, trace of organics. 75 BG 1 2 60 86 3 15 100 86 Clayey silt, dark yellowish brown, stiff, hard. 20 4 90 86 25 30 5 **8**G 90 Sandy clay, fine, medium light brown, soft, wet. 35 6 90 **BG** 5 Silty sand, medium, light brown, grayish orange to yellow gray. SC

E	Envir			al &			© De:	signs, Inc.	Monitoring Wel	1 07-	-MW-UF		
Pro	ect: A	MS H	emph						Location: Hillington, TN SHAU	47 - Bulo	ing N-128		
	rect No								Surface Elevations feet insi			1	
	rted at								TOC Elevation: feet and		Manusad		
	ng Met								Depth to Groundwater: feet Groundwater Elevation: feet m		Measured		
	ng Con				Orin	0			Total Depth: 45.0 feet				
	dogst								Hell Screen: 35 to 45 leet				
DEPTH INFEET	LIPPLOSIC	AWLYTICAL	SWITEND	* PECOVERY	PTD (tron)	GRAPHOC LOG	SOL CLASS	GEOL(OGIC DESCRIPTION	ELEV. (n-mad)	WELL DIAGR	AM	
	\bigvee						sc	Silty sand, medium, brown.	, yellowish orange to light			- 10/20 send -	
45-						6.03.02		Log information tal Cockfield well at S	ten from the boring for the MHU#7 Site 5.		T	•	
50-													
55-			7	•0	86							4	
1													
			•										
60-													
65-							٠						
70-													
	1		- 1		i		ĺ				1		

80-

Environmental C	ntal & Safety Designs, Inc.	Monitoring Well 07	-MW-5LF
Project: NAS Memoris			
Project No.: NOOM		Location: Milington, TN SNAUM7 - 8 Surface Elevation: feet msl	uony
Started at on 1-09-95		TOC Elevations feet mail	
Completed at on 2-21-95	-2I-95	Depth to Groundwater: feet	Heasyed
Drilling Method: Rotasonic	tsonc	Groundwater Elevation: feet mal	
Drilling Company: North Star		Total Depth: 75.0 feet	
Geologist: Jack Carmichael	mohael	Hell Screen: 66 to 76 feet	
DEPTH SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SWALE SW	SOIL CLASS	LOGIC DESCRIPTION	WELL DIAGRAM
10 2 60 15 3 100 20 4 90 25 90 35 8 90	Clayey sit, mode trace of organic TS 86 Clayey sit, dark ML Clayey sit, dark ML Sandy clay, fine	rate brown to yellowish brown,	To Sch. 40 PVC and 8" steel casing————————————————————————————————————

Monitoring Well 07-MW-5LF Environmental & Safety Designs, Inc. Project: NAS Memoria Location Hangton, TN SHALLET - Building Project No.: NOOB4 Surface Devation: feet inst Started at on 1-09-95 TOC Elevation: feet inst Completed at an 2-21-95 Depth to Groundwater. I eet Measured Orling Method: Rotasanic Groundwater Elevation: feet mail Driling Company: North Star Driling Total Deptit 76.0 feet Geologist Jack Carmichael Hell Screen: 68 to 76 feet GRAPHOC LOG UTHOLOGIC SAPPLE SASS S ANNLYTECH SAMPLE K RECOVER SWALEND PTO tros WELL DIAGRAM GEOLOGIC DESCRIPTION OEPTH NFEET BE. Silty sand, medium, yellowish orange to light SC brown. 45 Sand, medium, micaceous, yellowish orange to 0 light brown. 2" ID, Sch. 40 PVC and 8" steet casing Sand, medium, grayish orange, micaceous. 50 O 55 7 60 86 0 0 0 0 60-0 0 0 65-O Gravelly sand, coarse to very coarse, dark yellowish orange. 0.01 slot, PVC screen 70-O 75 87.5 86 8 Log information taken from the boring for the Cockfield well at SMMU#7 Site 5. 80

Evs	WE ®		Monitoring Well 07-MW-5UC			
Environmental &	Safety Des	signs, Inc.				
Project: NAS Memphs			Location: Memphs, TN			
Project No.: A0094			Surface Devator: feet #sl			
Started at on 1-09-95			TOC Devators feet and			
Completed at an 2-21-95			Depth to Groundwater. feet		Measured	
Orling Method: Rolasonic	05.4		Groundwater Elevation: feet red Total Depth: ISSO feet			
Drilling Company: North Star Geologist: Jack Carrichael	UNIN		Hel Screen 22 to 32 feet			
DEPTH NFET LITHQUAGE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SA	PTD (spm) GRAPHOC LOG SOIL CLASS	GEOL(OGIC DESCRIPTION	ELEV. (M-mat)	HELL DIAGRAM	
5 60 6 7 10 8 90 11 12 25 13 14 30 15 90 18 19 20 19 19 19 19 19 19 19 19 19 19 19 19 19	B6	Clayey silt, dark y	ellowish brown, stiff, hard. Reclium light brown, soft, wet. I light brown, grayish orange to		The Sch. 40 PVC and 8" steel casing The sch. 40 PVC and 8" steel casing The sch. 40 PVC and 8" steel casing The sch. 40 PVC and 8" steel casing The sch. 40 PVC and 8" steel casing The sch. 40 PVC and 8" steel casing	

Enviro	En nment	al &	Sal	FE	Des	signs, Inc.	Monitoring Well 07-MW-5UC				
Project: NA				-		19113, 1110.	Location, Hemphis, TN				
Project No.:							Surface Elevations feet asi				
Started at		8					TOC Devators feet as				
Completed a							Depth to Groundwater: feet		Heestrect		
Orling Metho	t Rotas	nc					Groundwater Elevation: feet ins				
Drilling Compa			Oran	7			Total Depth: 135.0 feet				
Geologist: Jack Cannichael							Well Screen: 22 to 132 feet				
DEPTH NFEET UTHOLOGIC SWALE	SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SA						OGIC DESCRIPTION	ELEV. (R-ma)	WELL DIAGRAM		
85- 95- 100- 110- 120	42 43 44 45 48 47 48 49 50 51	80	86 86 86 86 86 86 86 86 86 86 86 86 86		SC	clay lenses.	Mazy, from 119' to 119.5'.		Pinnininininininininininininininininini		

Environmental & Safety Designs, Inc. Monitoring Well 07-MW-5UC Project: NAS Memoris Locations Memories, TN Project No.: NOO94 Surface Elevation: leet its! Started at on 1-09-95 TOC Elevation: feet mil Completed at on 2-21-95 Depth to Groundwater: feet Driling Method: Rotasonic Groundwater Elevation: feet its/ Driling Company: North Star Driling Total Depth: 1350 feet Geologist: Jack Carmichael Well Screen: 122 to 132 feet ELEV. (R-ma) ANNEYTICA SAPPLE SASS. X RECOVER SWALEND 8 GEOLOGIC DESCRIPTION DEPTH INFEET 6 63 8G 64 BG SC 125 65 BG 66 86 Clay, dusky brown, waxy, mixed with lightic 130 67 86 CL 68 86

End of boring at 135'.

8G

90

135

140-

145-

150-

155-

160

Measurect

- 0.01 slot, PVC screen

HELL DIAGRAM

Env	iron	En ent	al &	Sa	fety	e y De	signs, Inc.	Monitoring Well 07-MW-65				
Project	NASH	emore.	5					Location Minglan, TN SHALL	7 - 8.k	ing N-28		
Project								Surface Elevation: feet mil				
Started								TOC Elevation: feet ms/				
Complet				95				Depth to Groundwater: feet		Heasurect		
Orling P								Groundwater Elevations leet msi				
Orang C				Ortin	9			Total Depth: 20.0 feet				
	GEORGE SAME TICH COOK SAME FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR COOK OF THE FOR							OGIC DESCRIPTION	ELEV. (M-ma)	HELL DIAGRAM		
2	7 4 0	8	×	-	10	1 6	SR and helph		-			
5-		1	66	86			Fill and brick. Clayey silt, modera with yellow gray.	ite yellowish brown, mottled		bentonite seel of		
15		2	70	86		ML				- 0.01 slot, PVC screen		
25-		4	60	86			Log information tal Cockfield well at S	ten from the boring for the MMU#7 site 6.				

◉ Monitoring Well 07-MW-6UF Environmental & Safety Designs, Inc. Project: NAS Memphs Location: Mington, TN SWALM7 - Building N-126 Project No.: NOOP4 Surface Elevations feet mail Started at 0820 on 2-10-95 TOC Elevation: feet mal Completed at 1010 on 2-14-95 **Heasured** Depth to Groundwater. feet Orling Method: Rotasano Groundwater Elevation: feet red Orling Company: North Star Driling Total Depth: 55.0 feet Geologist Ben Brantley Well Screen: 40 to 50 feet GRAPHEC LOS ANNITION LITHOLOGIC QASS SWELEND 3 WELL DIAGRAM GEOLOGIC DESCRIPTION BEY. 8 P Fill and brick. 66 86 Clayey silt, moderate yellowish brown, mottled with yellow gray. 10 70 86 40 PVC and 8" steel cealing 15 3 70 86 ML 20-ID. Sch. Clayey silt, olive brown to olive gray, hard, stiff. 25 86 60 Clayey silt, light brown to yellowish brown, medium stiff. 30-5 86 85 Sity clayey sand, fine to very fine, yellowish 35 orange to reddish brown. SC

Monitoring Well 07-MW-6UF Environmental & Safety Designs, Inc. Project: NAS Nemons Location: Hangton, TN SHAW17 - Building N-128 Project No.: NO094 Surface Elevation: feet ad Started at 0820 on 2-10-95 TOC Devation: feet mal Completed at 1010 on 2-14-95 Depth to Groundwater: feet Heasurect Orling Method: Rotasano Groundwater Elevation: feet mai Driling Company: North Star Driling Total Depth: 55.0 feet Hell Screen: 40 to 50 feet Geologist: Ben Brandley 1 SWALEND SOR CLASS X RECOVER **3** WELL DIAGRAM GEOLOGIC DESCRIPTION CIETH INFEET 6 54 86 SC Sity sand, very fine to fine, traces of clay casts, grayish orange to pale yellowish orange. 55 100 86 Log information taken from the boring for the Cockfield well at SWMU#7 site 6. 60-65-70-75-80

Monitoring Well 07-MW-6LF Environmental & Safety Designs, Inc. Locators Hangton, TN. SHAU67 - Building N-128 Project: NAS Memories Project No.: N0094 Surface Elevation: feet and Started at 0820 on 2-10-95 TOC Elevation: feet mal Completed at IDIO on 2-H-95 Measured Depth to Groundwater: feet Groundwater Elevations | feet mail Orling Method: Rotasonic Drilling Company: North Star Drilling Total Depth: 78.0 feet Geologist Ben Brandley Hel Screen: 87 to 77 feet ANNLYTICAL SAPLE 228 X RECOVER SWALEND Ì HELL DIAGRAM GEOLOGIC DESCRIPTION BEY. Fill and brick. **B**6 66 Clayey sit, moderate yellowish brown, mottled with yellow gray. 70 86 10, Sch. 40 PVC and 8" steel casing 15 3 70 86 ML 20 Clayey sit, olive brown to olive gray, hard, stiff. 25 86 60 Clayey silt, light brown to yellowish brown, medium stiff. 30 86 5 85 Sity clayey sand, fine to very fine, yellowish 35 orange to reddish brown. SC

Monitoring Well 07-MW-6LF Environmental & Safety Designs, Inc. Location: Mington, TN SHALM7 - Building N-126 Project: NAS Memoris Project No.: NOOS4 Surface Elevation: leet mail Started at 0820 on 2-10-95 TOC Devators feet ad Completed at 1010 on 2-14-85 **Heasured** Depth to Groundwater: feet Orling Method: Rotasano Groundwater Elevation: feet msi Total Deptit 78.0 feet Driling Company: North Star Driling Well Screen: 67 to 77 feet Geologist Ben Brantley QASS 3 HELL DIAGRAM GEOLOGIC DESCRIPTION BE. 86 54 Sity sand, very fine to fine, traces of clay casts, grayish orange to pale yellowish orange. SC 2" 10, Sch. 40 PVC and 8" steet casing BG (55 7 100 Sand, fine to coarse, pale yellowish brown to moderate yellowish brown. 60 70 65 86 G₽ 0.01 slot, PVC screen 70 75 0 100 BG Log information taken from the boring for the Cockfield well at SWMU#7 site 6.

Monitoring Well 07-MW-6UC Environmental & Safety Designs, Inc. Project: NAS Hemphs Location: Mindlon TN SHAU67 - Building N-126 Project No.: NOOS4 Surface Elevation: feet insi Started at 0820 on 2-10-95 TOC Elevation: feet mal Completed at IDID on 2-14-95 Depth to Groundwater: feet Devese Orling Method Rotasonic Groundwater Elevation: feet mail Orling Company: North Star Orling Total Depth: IDIO leet Geologist: Ben Brantley Well Screen: 84.5 to 94.5 feet Ī ANNETICAL LITHOLOGIC X RECOVER SOR GLASS 70 CO **HELL DIAGRAM** DEPTH NFEET GEOLOGIC DESCRIPTION ee. Fill and brick. 66 Clayey silt, moderate yellowish brown, mottled with yellow gray. 86 1 2 86 3 86 70 86 BG 2" 10, Sch. 40 PVC and 6" steel casing 15 8 70 86 7 86 ML 8 86 20 86 86 Clayey silt, olive brown to olive gray, hard, stiff. 25 Ħ 60 86 12 86 Clayey silt, light brown to yellowish brown, 13 86 medium stiff. 30 14 86 85 15 86 Sity clayey sand, fine to very fine, yellowish 35 18 86 orange to reddish brown.

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SC

Environmental & Safety Designs, Inc.									Monitoring Well 07-MW-6UC				
	Project: NAS Nempris								Location Ministro TN CHAIM	7 - A-	ing N-26		
	Project No.: A0094								Location: Allington, TN: SHALIF7 - Building N-128 Surface Elevation: feet msl				
	Started at 0820 on 2-10-95								TOC Elevation: feet rist				
	peter		_						Depth to Groundwater: feet		Heasured		
	ing Met								Groundwater Elevations feet mist				
					Orin	0			Total Depth: 1010 feet				
	Drilling Company: North Star Drilling Geologist: Ben Brantley								Hel Screen: 845 to 945 feet				
OEPTH INFEET	N 12						SOL CLASS	GEOLG	OGIC DESCRIPTION				
	1		10		BG	33							
	V					(5,0)				1			
	łΛi		20		86	33					and 8" steet casing ————————————————————————————————————		
	/ /					4.4							
45-			21	54	BG	757			ne to fine, traces of clay				
	1\ /					2		casts, grayish orar	nge to pale yellowish orange.	1			
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	V			1		2.75					2		
55-	1		26	100	86	W a		Sand, fine to coars	se, pale yellowish brown to	1			
1	N /		27	l		0		moderate yellowish	•	1			
	1\ /I		2/	l	96	0			•				
}	W		28	l	86	0	*		•		miniminiminiminiminul		
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	/ V		35		86	0							
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,	IVI		37		86	1 9							
	ΙĂΙ					1/4			laginated, pale yellowish				
	ΙV	ļ	38		86	20	SC	orange to dark ye	-				
80-						777		Sity clay with fine	sand, light brownish gray to		T ST T		

Monitoring Well 07-MW-6UC Environmental & Safety Designs, Inc. Project: NAS Memoria Location: Mington, TN SHMUNT - Building N-26 Project No.: NOOP4 Surface Elevation: feet insi Started at 0820 on 2-10-95 TOC Elevation: feet msi Completed at 1010 on 2-14-95 Heasured Depth to Groundwater: feet Drilling Method: Rotasanic Groundwater Elevation: feet msl Orling Company: North Star Driling Total Depth: 1010 feet Geologist Ben Brantley Well Screen: 84.5 to 94.5 feet BEV. (R-mad AWLYTICA SAFILE CASS SWALEND X RECOVER WELL DIAGRAM GEOLOGIC DESCRIPTION DEPTH £ 86 40 **B**6 85 41 ØG 109 42 86 SC 43 86 44 BG **B**6 Clay, interbedded very fine sand with silt, 48 **B6** becoming more waxy. 120 47 86 CL 48 86 100-49 120 8G End of boring 105 110-115-120

E	nvir			al &		FE fety	De	signs, Inc.	Monitoring Well 07-MW-7S				
		VAS M				<u>_</u>			Location: Mington, TN SHMW17 - Building N-128				
Project No.: ACCOM									Surface Elevations feet and				
Sta	Started at 1750 on 2-10-95								TOC Elevation: feet asi	***			
Com	plete	at o	n 2-1	1-95		_			Depth to Groundwater: feet		Measured		
0.4	Completed at an 2-14-95 Drilling Method: Rotasanic								Groundwater Elevation: feet mil				
Dr6	ng Cor	TOATY	Non	h Sta	Oran	9			Total Depth: 20.0 feet				
Geo	Drilling Company: North Star Drilling Geologist: Ben Brantley								Well Screen: IQO to 2QO feet				
OGPTH NFEET	LTHOLOGIC	ANALYTICAL	SWELEND	X RECOVERY	PTD (spen)	GRAPHOC LOB	SOL CLASS	Œ0.c	OGIC DESCRIPTION	BEV. (N-md	HELL DIAGRAM		
5-	X		1	70	86		ML	Clayey sit, modera motited with yellow	ite yellowish brown, organics, ish gray sät.		IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII		
15- -			3	80	B6			moist.	ive gray to olive brown, soft,		0.01 slot, PVC screen		
								Log information tal Cockfield well at S	ten from the boring for the				
25-			. 4	65	96								
30-													
35-									•				

Monitoring Well 07-MW-7UF Environmental & Safety Designs, Inc. Location: Manglon, TN SHALM7 - Building N-26 Project NAS Memoris Project No.: NOOP4 Surface Elevation: feet mil Started at 1750 on 2-10-06 TOC Elevation: feet and Completed at on 2-14-95 Deoth to Groundwater: feet Measured Driling Method: Rotasonic Groundwater Elevation feet ms Orling Company: North Star Driling Total Deptit: 50.0 feet Geologist: Ben Brandley Hel Screen: 400 to 500 feet 1 ANN YTECH SWPLE QASS SWEEN X RECOVER 200 WELL DIAGRAM GEOLOGIC DESCRIPTION EE. 8 Clayey silt, moderate yellowish brown, organics, mottled with yellowish gray silt. 125 86 ١ Ю 2 70 86 and 6" steet casing 3 15 80 86 Clayey sit, light olive gray to olive brown, soft, moist. 20 ğ 25 65 86 Sity clay, light brown to moderate yellowish brown. 30-35 5 90 86 Silty sand, moderate yellowish brown to dark yellowish orange, stained reddish brown. SC GP Sand, fine to medium, sitty, grayish orange to dark yellowish orange, at 39' there is some gray sand

Monitoring Well 07-MW-7UF Environmental & Safety Designs, Inc. Locations Hangton, TN SHAW7 - Building N-128 Project NAS Hempha Project No.: NOO94 Surface Devatort feet mail Started at 1750 on 2-10-95 TOC Elevation: feet as Completed at on 2-14-95 Heesurect Depth to Groundwater: feet Orling Method: Rotasano Groundwater Elevations feet and Drilling Company: North Star Drilling Total Depth: 500 feet Geologist: Ben Brandley Hel Screen: 40.0 to 50.0 feet 5 SOIL CLASS X RECOVER 3 HELL DIAGRAM GEOLOGIC DESCRIPTION O 0.01 slot, PVC screen 86 110 GP 50 Log information taken from the boring for the Cockfield well at SMMU#7 site 7. **55**· 7 90 **B6** 60-65-70-75-

Monitoring Well 07-MW-7UC Environmental & Safety Designs, Inc. Locator: Mington, TN SHALM7 - Building N-128 Project: NAS Memoris Project No.: NOOS4 Surface Elevation: feet inst Started at 1750 on 2-10-95 TOC Devators leet mil Completed at on 2-14-95 Measured Depth to Groundwater: feet Orling Method: Rotasano Groundwater Elevation: feet mil Drilling Company: North Star Onling Total Depth: 105.0 feet Geologist: Ben Brantley Well Screen: 925 to 1025 feet 1 288 ANNLYTICA SAPILE RECOVER SWALEND 3 HELL DIAGRAM GEOLOGIC DESCRIPTION DEPTH INFEET E. 2 Clayey sit, moderate yellowish brown, organics, nottled with yellowish gray sat. 1 0.4 2 86 125 3 **B6** 86 5 70 86 86 7 86 80 Clayey sit, light olive gray to olive brown, soft, 86 Boist. MŁ 86 Ş 40 PVC 20 10 86 Ħ 86 10, Sch. 12 86 25 65 13 86 **B6** Sity clay, light brown to moderate yellowish prown. 30 15 86 ununununununununun 16 86 17 86 35 90 Sity sand, moderate yellowish brown to dark 86 yellowish orange, stained reddish brown. SC

Sand, fine to medium, sitty, grayish orange to dark yellowish orange, at 39" there is some gray

10

86

GP

E	Envir			7		FEE ety		igns, Inc.	Monitoring Well		
Pro	ect N	AS NE	mons						Location Mington TN SHALM	7 - Buld	ng N-86
	ect No.							···	Surface Elevators feet mal		
	rted at								TOC Elevation: feet and		Measured
	peted					···			Depth to Groundwater. feet		
	ng Meth ng Com				<u> </u>				Groundwater Elevation: feet mail Total Depth: 77.0 feet		
	ologist				U	<u>/</u>			Hel Screen: 68.0 to 78.0 feet		
DEPTH	T	ANNLYTICAL	SWELEND	X RECOVERY	PTO (spen)	GRAPHOC LOG	SOR CLASS	GEOL(OGIC DESCRIPTION	BEV. (n-mal	WELL DIAGRAM
45- 50- 55- 70-			8	110	B6 B6			grayish orange to Sand with interdis grained. Clay is p	line to very coarse grained, dark yellowish orange. bursed clay, fine to medium inkish gray, moist.		
80-	1							Cockfield well at			

Monitoring Well 07-MW-7UC Environmental & Safety Designs, Inc. Project: NAS Memphs Location: Mington, TN SHALM7 - Building N-128 Project No.: NOOS4 Surface Elevation: feet mil Started at 1750 on 2-10-95 TOC Elevation: feet inst Completed at an 2-14-95 Depth to Groundwater: feet Measured Draing Method Rolasonic Groundwater Elevation: feet mil Drilling Company: North Star Drilling Total Depth: 105.0 feet Geologist: Ben Brantley Well Screen: 925 to 1025 feet 1 m THATALIENT STANFE TURNOTORIE TURNOTORIE GRAPHEC LOG QASS SWELEND B GEOLOGIC DESCRIPTION WELL DIAGRAM DEPTH EE. 8 2 Clayey sift, moderate yellowish brown, organics, mottled with yellowish gray sit. 1 0.4 2 86 125 3 86 86 Ю 5 70 86 86 2" 10, Sch. 40 PVC and 8" steet casing 7 86 80 Clayey sit, light olive gray to olive brown, soft, 8 86 Boist. ML 9 **B**6 20 10 86 11 86 12 86 25 65 IJ 96 86 Silty clay, light brown to moderate yellowish brown. 30 15 96 16 86 17 86 35 90 Sity sand, moderate yellowish brown to dark 18 86 yellowish orange, stained reddish brown. SC

Sand, fine to medium, silty, grayish orange to dark yellowish orange, at 39' there is some gray

10

B6

GP

Monitoring Well 07-MW-7UC Environmental & Safety Designs, Inc. Location Hangton, TN SHALM7 - Building N-126 Project NAS Memoris Project No.: NOOS4 Surface Elevators leet ad Started at 1750 on 2-10-95 TOC Elevation: leet mail Completed at on 2-M-95 Measured Depth to Groundwater: feet Groundwater Elevation: leet inst Orling Method: Rotasonic Total Depth: IDSO feet Drilling Company: North Star Orlling Well Screen: 925 to 1025 feet Geologist: Ben Brantley AWLTER GRAPHEC LOG LITHOLOGIC SOIL CLASS Ī X RECOVER HELL DIAGRAM GEOLOGIC DESCRIPTION DEFTH BE. 20 **8**6 0 86 21 45 22 110 8G 23 86 86 50 25 86 28 2" 10, Sch. 40 PVC and 8" steel casing 55. 27 90 86 28 86 10 20 GP 60-0 30 86 0 Sand and gravel, fine to very coarse grained, grayish orange to dark yellowish orange. 31 **B6** 85 32 110 86 33 86 86 70-35 86 Sand with interdisbursed clay, fine to medium grained. Clay is pinkish gray, moist. 36 86 37 95 86 38 86 30 8G Sand, interbedded with clay, grayish orange, then becomes sifty sand, very fine grained, clay is dack vellowish orange

Environmental & Safety Designs, Inc. Monitoring Well 07-MW-7UC Project: NAS Memoria Location: Mington, TN SHAUF7 - Building N-126 Project No.: NOOS4 Surface Elevation: leet mail Started at 1750 on 2-10-95 TOC Elevation: feet ast Completed at on 2-14-95 Heasured Depth to Groundwater. feet Orling Hethod: Rotasonic Groundwater Elevation: feet and Orling Company: North Star Driling Total Depth: 106.0 feet Geologist: Ben Brandley Well Screen: 925 to 1025 feet T E AMLYTICA SAFLE **CASS** SWALEND X RECOVER 3 WELL DIAGRAM GEOLOGIC DESCRIPTION DEPTH NFEET BEY. 2 2" 10, Sch. 40 PVC and 8" steel casing 86 BG 85 100 42 Silty sand, with interbedded clay, very fine sand, dusky yellowish brown clay to moderate brown, mottled with light olive to olive gray sand. 43 BG BG 45 86 SC 48 86 0.01 slot, PVC screen 120 86 48 86 49 **B6** 100-50 **B**6 Clay, laminations of sand, dusky yellowish brown 51 86 to moderate brown clay, light office to office gray CL sand, waxy. 105 115 86 End of boring at 105'. 110 115 120

Monitoring Well 07-MW-8UF

E	Envir	onm	ent	al &	Sa	fet	y Do	esigns, Inc.			
Pro	ect A	MSM	enore:	,					Location Minglan TN SHALM	7 - Buk	ing N-28
	ect No								Surface Elevators feet msf		
	rted at								TOC Devators feet red		
	pleted				26				Depth to Groundwater: feet		Heasured
	ng Met								Groundwater Devators leet mai		
	ng Com	_	_		Drin	9			Total Depth: 45 feet		
Geo	logst	Dawo	Lack	!		_			Hel Screen: 360 to 460 feet		
OBPTH NFEET	LITHOLOGIC SAPPLE	AWLYTICAL SAPLE	SMPLEND	* PECOVERY	PD (ton)	COLANGE LOG	SOR O ASS	GEOL	OGIC DESCRIPTION	BEV. (N-ma)	HELL DIAGRAM
5 10 25 35		ARS .	3 3	140 96 85	86 86 86		55 ML 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Clayey sit, yellowing gray. Clayey sit, noive gray. Clayey sit, olive gray. Sit, light olive gray. Sandy sit, moderate to lift. Sandy sit, moderate sand, fine, dark yellowing grayish orange, sit.	te yellowish brown. Howish orange mottled with ty.	TO TO THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF THE PARTY OF	
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Monitoring Well 07-MW-8UF

8	Envir	OUM	ent	al &	Sa	fety	De	signs, Inc.			
	ect /					<u>`</u>			Location Hington, TN SHALIF	- But	ng H-28
	ect N								Surface Elevation: feet asi		
	rted a								TOC Elevation: feet rel		
	pletec				9 5				Depth to Groundwater: feet		Measured
	ng Mel								Groundwater Elevation: feet mai		
	ng Con				Orth	9			Total Depth: 45 feet		
Geo	logst:	Daws	Lade	<u>'</u>	_			· · · · · · · · · · · · · · · · · · ·	Hel Screen: 360 to 460 feet		
OBTH NFEET	LITHOLOGIC	ANNLYTICAL SAMPLE	SWALEND	X RECOVERY	(wod) CLA	BRANDIC LOS	SOIL CLASS	G€OL(OGIC DESCRIPTION	BEV. (II-ma)	WELL DIAGRAM
45-	\bigvee		7	80	BG	0000	GP	Log information tal Cockfield well at S	ken form the boring for the WMU#7 site 8.		11111111111111111111111111111111111111
50-									·		
55-				5							·
60-											
65-		٠									
70-											
75-											
80-											

Project: NAS Memorias Location: Affingtion TN SMAUNT - Building N-28 Project Not: A0094 Surface Elevation: feet asi TOC Elevation: feet asi Competed at 0000 on 2-3-95 Competed at 0000 on 2-3-95 Drilling Method: Anivasianic Drilling Company: North Star Drilling Geologist: David Ladd Red Screen: 68.0 to 78.0 feet GEOLOGIC DESCRIPTION Light Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start Start St	E	 Invir			ZS al &		<i>F</i>	• Des	signs, Inc.	Monitoring Well	07-	MW-8LF
Started at 0000 on 2-8-85 Completed at 200 on 2-24-65 Depth to Groundwater: feet and Drilling Method: Rotasonic Groundwater Elevation: feet and Drilling Method: Rotasonic Groundwater Elevation: feet and Total Depth: 76 feet Geologist: Dento Ladd Med Screen: 88.0 to 78.0 feet Geologist: Dento Ladd GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION Clayery salt, yellowish brown, mottled yellowish gray. Clayery salt, woderate brown, most, soft. Clayery salt, noderate brown, most, soft.				_						Location Hington TN SHALL	17 - Buld	ng N-28
Completed at \$20 on 2-24-96 Displication of Groundwater feet Measured Displication Antasonic Displication Antasonic Displication of Antasonic Displication of Antasonic Displication of Antasonic Displication of Antasonic Displication of Antasonic Displication of Antasonic Displication of Antasonic Displication of Antasonic Displication of Antasonic Displication of Antasonic Displication of Antasonic Displication of Antasonic Displication of Antasonic Displication of Antasonic Displication of Antasonic Displication of Antasonic Displication of Antasonic Displication of Antasonic Displication of Antasonic Displication of Antasonic Displication of Antasonic Displication of Antasonic Displication of Antasonic Groundwater Elevation feet as an antasonic Feet as an antasonic Groundwater Elevation feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as an antasonic Feet as antasonic Feet as an antasonic Feet as an antasonic Feet as an										Surface Elevation: feet asi		
Drilling Method: Rotasonic Groundwater Elevation: Reet ass Drilling Company: North Star Drilling Geologist: Devid Ladd Met Screen: 88.0 to 78.0 feet Heat Screen: 88.0 to 78.0 feet Heat Screen: 88.0 to 78.0 feet Heat Screen: 88.0 to 78.0 feet GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIP	Sta	ned at	0900	on 2	-1-95					TOC Elevation: feet risk		
Drilling Company: North Star Drilling Geologist: Dawid Leadd Ned Screet: 68.0 to 78.0 feet Ned Screet: 68.0 to 78.0 feet GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGI	Com	pieted.	at P	O on a	2-24-	9 6				Depth to Groundwater: feet		Heasted
GEOLOGIC DESCRIPTION HELL DIAGRAM Clayey salt, wellowish brown, moist, soft. Clayey salt, moderate brown, moist, soft. Clayey salt, olive gray, medium stiff to soft.	Or B	ng Meth	noct /	Potas	anc					Groundwater Elevation: feet ins		
THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE DIAGRAM THE D						Oran	9					
1 140 BG Clayey salt, yellowish brown, mottled yellowish gray. Clayey salt, moderate brown, moist, soft. 2 98 BG ML Clayey salt, olive gray, medium stiff to soft.	Geo	logst (Down	Lado	1					Well Screen: 66.0 to 78.0 feet		
Clayey silt, yellowish brown, mottled yellowish gray. Clayey silt, moderate brown, moist, soft. 2 98 86 ML Clayey silt, olive gray, medium stiff to soft.	DEPTH NFEET	LINGLOSIC	AWLYTICAL SAMPLE	SWELEND	X RECOVERY	PTD (Score)	GRAPHIC LOG	SOIL GLASS	GEOL(OGIC DESCRIPTION	BEV. (fi-ma)	WELL DIAGRAM
T T T I I I I NIN I	5- 10- 20-		₹ 3	1 2 3	98 85	B6 B6 B6	000	ML	Clayey sit, anders Clayey sit, olive gr Sit, light olive gray Sit, moderate to light Sandy sit, moderate Sand, fine, dark ye grayish orange, sit	ray, medium stiff to soft. y with brown motting. ght brown, hard. te yellowish brown.		40 PVC

Monitoring Well 07-MW-8LF Environmental & Safety Designs, Inc. SHALWY - BUILDING N-28 Project: NAS Memoria Location Mangton TN Project No.: N0094 Surface Elevation: feet ma Started at 0900 on 2-#-95 TOC Elevation: feet ad Completed at PID on 2-24-95 Measured Depth to Groundwater. feet Orling Method: Rotasonic Groundwater Elevation: feet mail Orling Company: North Star Drling Total Depth: 76 feet Geologist David Ladd Well Screen: 86.0 to 76.0 feet GRAPHEC LOG ANN YTECH SAPPLE K RECOVERY SOIL QASS SWALE SWALEND 70 CO WELL DIAGRAM GEOLOGIC DESCRIPTION <u>6</u> 0 7 80 BG Sand, fine, grayish orange to dark yellowish orange, wet, scattered gravel. O 2" ID, Sch. 40 PVC and 8" steel casing 55 96 86 7 60 0 Sand and gravel, fine to very coarse grained, grayish orange to dark yellowish orange, gravel. O 65 9 90 86 0.01 slot, PVC screen 70 75 10 0 Ю 90 BG Log information taken form the boring for the Cockfield well at SMMU#7 site & 80

			Ē	7		FE	•		Log of Monitor	ng W	ell 07-MW-8U
[Envir	onn	nent	:al &	Sa	fety	/ De	signs, Inc.			
	ject: /								Location: Mangton, TN SHMU	17 - Buk	ing N-126
	ject No							· · · · · · · · · · · · · · · · · · ·	Surface Elevation: feet ms/		
Sta	rted a	t <i>090</i>	0 on 2	?-11-9:	5				TOC Elevation: feet msl		
Con	npletec	1 at 12	10 an	2-24-	.95				Depth to Groundwater: feet		Measurect
Dr	ing Met	hod:	Rotas	ionic					Groundwater Elevation: feet ms	<i>I</i>	
	ing Con				Drillin	9			Total Depth: 125 feet		<u> </u>
Geo	ologist:	Davio	1 Lack	1		_			Well Screen: 113.5 below grade to	T	elow grade feet
DEPTH IN FEET	LITHOLOGIC	ANALYTICAL SAMPLE	SAMPLE NO.	X RECOVERY	PIO (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLG	OGIC DESCRIPTION	ELEV. (ft-mst)	WELL DIAGRAM
			1		BG BG			Clayey silt, yellowi gray.	sh brown, mottled yellowish		
5-	X		3	140	86 86 86			Clayey silt, modera	ate brown, moist, soft.		
10-			5	98	BG						
			6		BG						
15-			7 8	98	BG BG						steel casing
	\bigvee		9		BG		ML	Clayey silt, olive g	ay, medium stiff to soft.		and 8" st
20-		4	10		BG BG			Silt, light olive gray	/ with brown mottling.	-	Sch. 40 Pv(
25-			•	85				Silt, moderate to li	ght brown, hard.		— 2" 10, Sch.
}	X		13		BG BG						
30-	$\langle \cdot \rangle$		14	80	BG BG			Conductive and	la vallaviah has va		
1	X		16		BG	\prod		Sandy silt, modera			
35	$\langle \rangle$		17	120	BG	0 0 0		Sand, fine, dark ye grayish orange, sill	flowish orange mottled with ly.		
1	\bigvee		18		ВG	0 0 0	GP	Sand, pale yellowis	h brown.		
40			19		BG	700					



Log of Monitoring Well 07-MW-8U

[Envir	onm	en	tal (S Sa	ifety	De	signs, Inc.			
	ect: /		_						Location: Mangton, TN SHMU	7 - Bul	dng N-126
	ject No								Surface Elevation: feet msl		
	rted a								TOC Elevation: feet msl		
	pletec				-95				Depth to Groundwater: feet		Measurect
	ng Met								Groundwater Elevation: feet ms	!	
	ng Con				or Only	rg			Total Depth: 125 feet		
Geo	ologist:	Dawc	1.20	0		1	,	т	Well Screen: 113.5 below grade to	1	elow grade feet
DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	* RECOVERY	PTD (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLG	OGIC DESCRIPTION	ELEV. (ft-ms)	WELL DIAGRAM
	$\Lambda \Lambda$		20		BG	VO					
	1 X I		21		BG	0 0					
45-			22	80	86	0 5		Sand, fine, gravish	orange to dark yellowish		
] :	Λ Λ		23		B6	0		orange, wet, scatte	- · ·		
	$ \setminus $		24		86	10 0					40 PvC and 8" steel casing ————————————————————————————————————
50-	XI		25		86	0					
	$ / \setminus $					0 9					
	/ \		26		86	0 4					00
55-			27	95	BG	0					40 PVC and 8" steel casing
	$\backslash / $		28		86		GP				8" ste
60-	ΧI		29		BG	100				į	/C and
•	M		30		BG	D d					40 PV(
	$/ \ $		31		BG	000			ne to very coarse grained,		
85-			32	90	BG	0		grayish orange to d	lark yellowish orange, gravel.		2". 10,
	\setminus / \mid		33		BG	0					
70-	1		34		BG	v 9					
	M		35		B6	N 9					
},	/ \		36		BG	0 3					
75			37	90	BG ·	0 4			•		miniminiminiminiminiminiminiminiminimin
}	\bigvee		38		BG			Sand, silty, very fine orange mottled with	e grained, dark yellowish light gray, wet.		
80			39		86		sc	3	or a service		

	Envir		4		S Sa		© De	signs, Inc.	Log of Monitori		
	ject: /			i\$					Location: Mington, TN SHMUN	7 - Buk	ding N-126
	ject N								Surface Elevation: feet msl		
	rted a								TOC Elevation: feet msl		
<u> </u>	npletec				-95				Depth to Groundwater: feet		Measured
	ing Met		~	_					Groundwater Elevation: feet insl	<u>. </u>	
	ng Con				r Dniir	8			Total Depth: 125 feet		
Geo	ologist:	Daw	Lao	7	Т			r	Well Screen: 113.5 below grade to	τ	BOW grade feet
DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	X RECOVERY	PTD (copm)	GPAPHIC LOG	SOIL CLASS	GEOL C	OGIC DESCRIPTION	ELEV. (fl-ms)	WELL DIAGRAM
			40		BG						
	$ \lambda $		41		BG			Sand, silty, very fir orange to very pal	ne grained, dark yellowish		
85-			42	85	BG			orange to very par	e orange.		
	$\backslash / $		43		BG				ne grained, dark yellowish n light gray, interbedded with		
90~	V		44		BG			gray clay, wet from			
			45		BG						gasing
	$/ \ V$		46		BG						steel c
95-			47	100	BG			brown to moderate	ded clay, very fine, dusky brown, mottled with light olive		VC and 8" steel casing ————————————————————————————————————
]	\backslash / \mid		48 49	!	BG BG			gray, rare marcasit	e nodules.		40 PVC and 8" steel casing
100-	X		50		BG		sc			:	
1	$/ \setminus $		51		BG						- 2" 10, Sch.
105			52	110	86						Remark IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII
1	$\setminus A$		53		BG						MITTINIAN PARTIES SE SE SE SE SE SE SE SE SE SE SE SE S
110-	\bigvee		54		BG						
	Λ		55		8G						
	/ \		56		BG						Pu I
115			57	110	BG						VC screen
	X		58		BG						0.01 slot, PVC screen
120	_\		59		BG		\dashv				

			Ē	71	<u> </u>		_@)	Masikaring Wall	07-	MM-05
	Envi	ronn	nent	al &	Sa	fety	De:	signs, Inc.	Monitoring Well	07-	-MM-82
_	ect /								Location Hangton, TN SWALK	7 - Buk	ing H-128
Pro	ect N	a: NO	094						Surface Elevation: feet asi		
Sta	rted a	t <i>6</i> 550	an 2	-1-05					TOC Elevations feet mal		
Con	pletec	sat c	n 2-2	25-86					Depth to Groundwater: feet		Heesurect
Dri	ng Me	thoat	Rotas	ione					Groundwater Elevation: feet asi		
	ng Car				Oran	9			Total Deptit: 20.5 feet		
Geo	dogst	<i>B</i> en	Brant	ey					Hel Screen: 10 to 20 feet		
OBTH. NFEET	UTHOLOGIC	WATTER	WEND	X PECONERY	(acct) Off	BRATHEC LOS	SOR OASS	GEO.C	OGIC DESCRIPTION	ELEV. (M-ma)	HELL DIAGRAM
-	130	20	S	 *	F	1	1 0				
5-	X		1	100	86			Clayey sāt, modera streaks, moist, sof	ate brown with yesow gray t.		coron manufacture see
10-			3	100	86		M.		brown, stiff and plastic.		
20-	\longrightarrow			Ì		Ш	-			1	<u> </u>
25-		•	4	95	86			Log information tal Cockfield well at S	ken from the boring for the newU07 site 9.		
30- 35-											

Environmental & Sa	FE ®	Monitoring Well	07-MW-9UF
Environmental & Sa	fety Designs, Inc.		
Project NAS Memphs		Location Allington TN SHALM?	' - Building N-126
Project No.: A0094		Surface Elevations feet mal	
Started at 1550 on 2-18-95		TOC Elevations feet mal	
Completed at an 2-25-95		Depth to Groundwater: feet	Heasured
Drilling Method: Rolasonic		Groundweter Elevation: feet mail	
Drilling Company: North Star Drillin	7	Total Depth: 42 feet	
Geologist: Ben Brandley		Hell Screen: 32 to 42 feet	
DEPTH NYEET LITHOLOGIC SWALE SWALE NO SWALE NO SWALE NO SWALE NO SWALE NO SWALE NO SWALE NO SWALE NO	SOF CLASS	GEOLOGIC DESCRIPTION	E MELL DIAGRAM
5 1 100 86 20 70 86 20 4 96 86 33 5 80 86	Clayey sit, streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streaks, according to the streak	eddish brown, stiff and plastic. Eight brown with clay inclusions. Inderate brown to reddish brown. Systion orange to Eight brown.	0.01 stot, PVC screen Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Properties Prope

Monitoring Well 07-MW-9UF Environmental & Safety Designs, Inc. Location: Mington, TN SHAW7 - Building N-126 Project NAS Memoria Project No.: NOOS4 Surface Devator: feet and Started at 1550 on 2-11-95 TOC Elevation feet and Completed at on 2-25-95 Depth to Groundwater: feet Measurect Orling Method: Rotasanic Groundwater Elevation: feet mai Drang Company: North Star Drang Total Depth: 42 feet Geologist Ben Brandley Well Screen: 32 to 42 feet 1 BRAMBIC LOS ANLYTICAL SAPLE SWOLEND X RECOVER 20 CO WELL DIAGRAM GEOLOGIC DESCRIPTION BEV. 6P O Log information taken from the boring for the Cockfield well at SMMU#7 site 9. 45-6 95 86 50 55-60-85 70-75-

Monitoring Well 07-MW-9LF Environmental & Safety Designs, Inc. Location: Minoton, TN SHALM7 - Building N-28 Project No.: NOOS4 Surface Elevations feet and Started at 1550 on 2-11-95 TOC Elevation feet as Completed at an 2-25-96 Heasurect Depth to Groundwater: feet Orling Method: Rotasanic Grandwater Elevation teet as Orling Company: North Star Driling Total Depth: 77 feet Geologist Ben Brandley Well Screen: 67 to 77 feet 1 GRAPHIC LOG ANNLYTEAL SAMPLE LITHOLOBIC SAMPLE X RECOVER SOAL GLASS SWALEND S ton GEOLOGIC DESCRIPTION WELL DIAGRAM MFEET BE. Clayey sit, moderate brown with yellow gray streaks, moist, soft. 1 100 86 2 70 **B6** ID, Sch. 40 PVC and 6" steel casing 3 100 86 Sity clay, reddish brown, stiff and plastic. MŁ Clayey silt, light brown with clay inclusions. 20. Sity clay, moderate brown to reddish brown. 25 95 86 30 Sand, fine, yellow orange to light brown. 35 5 86 0 80 0 GP Sand, medium, yellowish gray, micaceous. 0

Environmental 8	Safety		ians. Inc.	Monitoring Well	07-	MW-9LF
Project: NAS Memphs	outery		ignor the	Location Mington TN SHALM	7 - 840	10 N-26
Project No.: A0094				Surface Elevations feet mil		
Started at 1550 on 2-1-95				TOC Elevation: feet asi		
Completed at on 2-25-95				Depth to Groundwater: feet		Measured
Orling Method: Rolasonic			·	Groundweter Devation: feet mal		
Orlling Company: North Sta	Orling			Total Deptit: 77 feet		
Geologist: Ben Brantley	, , , , , , , , , , , , , , , , , , , 			Hell Screen: 67 to 77 feet		
DEPTH NFEET LINGLOSIC SWALE SWALE SWALE SWALE NO.	PTD (spee)	SOR CLASS	€€0 L0	OGIC DESCRIPTION	BEV. (N-md	HELL DIAGRAM
45— 6 95 50- 60- 70- 75- 80-	# # # # # # # # # # # # # # # # # # #	SC SC	yellowish orange. Sity sand, very fi	iken from the boring for the		TITITITITITITITITITITITITITITITITITITI

Monitoring Well 07-MW-9MC Environmental & Safety Designs, Inc. SHALM7 - Building N-28 Project: NAS Memoria Location Mington TN Surface Elevation: feet mai Project No.: NOOP4 Started at 550 on 2-1-95 TOC Elevations | feet and Completed at on 2-25-85 Meesured: Depth to Groundwater: feet Groundweter Develore feet mil Orling Method: Rolasonic Total Depth: 15 feet Orling Company: North Star Driling Geologist Ben Brandley Well Screen: 102 to 112 feet 1 BRATHEC LOS ANN YTEM SWPLE 888 SWALEND X RECOVER 3 HELL DIAGRAM GEOLOGIC DESCRIPTION MFEET BEY. 2 Clayey sit, moderate brown with yellow gray streaks, moist, soft. 86 86 2 100 3 86 86 70 86 86 10, Sch. 40 PVC and 8" steel cashq 100 86 Sity clay, reddish brown, stiff and plastic. M 96 96 Clayey silt, light brown with clay inclusions. 20-86 86 Sity clay, moderate brown to reddish brown. 25 12 95 88 B 86 86 30-86 15 86 16 Sand, fine, yellow orange to light brown. 35 80 86 GP **B6** Sand, medium, yellowish gray, micaceous. 86

Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-9MC

					JU1	Cty	<u> </u>	igita, the.			
	ect: /								Locations Hillington, TN SHALM	7 - Bu k	ing N-128
	ect No								Surface Elevation: feet insi		
	rted a								TOC Devators feet and		
Car	pletec	at a	n 2-2	5-95					Depth to Groundwater. I leet		Heasured
0.1	ng Met	hod /	Polas	onic					Groundwater Elevation: leet mal		
	ng Con				Oring	7			Total Depth: 16 feet		
Geo	togst	Ben t	3 and	y		, -,			Well Screen: 102 to 112 feet		
DEPTH INFEET	LTHOLOGIC	ANNETER	SMALEND	% NECONERY	5 CT (1)	GRAPHOC LOG	SOR GASS	G€OLC	GIC DESCRIPTION	BEV. (N-ma)	HELL DIAGRAM
	1/		20		86	Va					
] :	X		21		86	0 4					
45-	$\langle \ \rangle$		22	95	86	0					
						0					
	1 /		23		86	00					
50-	N /		24		96	0 4					
	V		25		96	0					
	W		26		96						
55-			27		96	V a					Cashq
	$ \Lambda $		28		86	0 9	GP				100
	/		29		96	0 9			•		- P
60-	$ \cdot $		30		86	0 0		Sand, Coarse to g yellowish orange.	ravelly, grayish orange to		Sch. 40 PVC and 8" steel casing ————————————————————————————————————
	/ N		31		86	0					4
65-		•	32	90	86	V 9		·			2 10, S
			33		B6	00					
	\				i	0 4					
70-	$ \backslash / $		34		86	0					
	V		35		86	O					
	$ \Lambda $		36		86			Sity sand, very fit with yellowish gray	ne, yellowish orange banded	1	miniminiminiminiminiminiminiminiminimin
75-	/		37		86			RIGI YEROMINI YE	•		
	$/ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$		38		86		SC		grayish brown, dusky brown	1	
80-			30		86			layers of clay with	ilight gray sand.		

Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-9MC

	-11VII	Ulli	leni	di e	1 29	iety	DE:	signs, Inc.			
Pro	ect:	NAS M	anon	3					Location: Mington, TN SHALI	7 - Buk	ing N+128
		a: NO							Surface Elevation: feet mai		
		t 6550							TOC Elevations feet and		
		d at c							Depth to Groundwater: feet		Measurect
		thoct							Groundwater Elevation: feet ma		
		mpany			r Oran	9			Total Deptir #5 feet		
Geo	ogst	<i>B</i> en	Brant	Ey					Well Screen: ICE to ICE feet		
NFEET	LTHOLOGIC	ANNUTE	SWELEND	X RECOVERY	FD (ton)	GRAPHIC LOG	SORL GLASS	GEOL(GIC DESCRIPTION	ELEV. (M-ma)	HELL DIAGRAM
	/	1	40		86	66				}	
	X		41		86						ID, Sch. 40 PVC and 6" steet casing ————————————————————————————————————
85-			42	95	86						Buys
•			43		86						steet ca
90-	\mathbb{N}		44		86						
	\bigvee		45 46		86	***					ID, Sch. 40 PVC and 6" steel casing communications.
95-	Y		47		96						D, Sch.
	Λ		48		96		SC		-		
1000-	$/\backslash$		49		86						8 8 8 8 8 8
1	$ \ $		50 51		B6 B6						+
105-			52	90	86						1 15 1 1
	$\setminus / $		53		86						0.01 stot, PVC screen
110-	X I		54		86	1555					
	$/\!\!\setminus\!\!\! $		55 56		86 86	55. ////		Clay, dusky brown,	hard and waxy, with medium	-	1
115			57	110	86		a	gray sand lenses.			
1								End of boring at #	5.		
120-									• .		



Client: EnSafe/Allen & Hoshall

Date of Report: 03/17/95 Project No.: E-2-837

Project Name: NAS Memphis, Tennessee

Sample I.D.: 007S000177

Soil Description: Yellow & light Gray Silt with fine sand

. •	Pre-Test	<u>Post Test</u>
Wet Density (Lbs/ft3)	118.6	120.8
Dry Density (Lbs/ft3)	101.0	101.9
Moisture (% Dry Wt)	17.4	18.6
Porosity (n)	.397	.383
Degree of Saturation (%)	.97	1.0

Permeability

Temperature Correction, $R_t = 1.048$

 $K_1 = 6.7 \times 10^{-5} \text{ cm/sec}$ $K_2 = 6.4 \times 10^{-5} \text{ cm/sec}$ $K_3 = 6.8 \times 10^{-5} \text{ cm/sec}$ $K_4 = 6.2 \times 10^{-5} \text{ cm/sec}$

Coefficient of Permeability, $K_{20} = 6.8 \times 10^{-5} \text{ cm/sec}$

Tested in accordance with Method 9100 of Test Methods for evaluation Solid Waste, Third Addition (SW-846) and in general accordance with ASTM D-5084-90.

Lab No. P-95-0019

Reviewed By:

David D. McCray



Client: EnSafe/Allen & Hoshall

Date of Report: 03/17/95 Project No.: E-2-837

Project Name: NAS Memphis, Tennessee

Sample I.D.: 07S0001112

Soil Description: Dark Brown Clay with Silt & fine

sand lenses running horizontal

	<u> Pre-Test</u>	<u>Post Test</u>
Wet Density (Lbs/ft3)	105.6	108.0
Dry Density (Lbs/ft3)	80.2	78.6
Moisture (% Dry Wt)	31.7	37.4
Porosity (n)	.506	.516
Degree of Saturation (%)	.96	1.0

Permeability

Temperature Correction, R, = 1.043

 $K_1 = 3.7 \times 10^{-8} \text{ cm/sec}$ $K_2 = 4.2 \times 10^{-8} \text{ cm/sec}$ $K_3 = 3.9 \times 10^{-8} \text{ cm/sec}$ $K_4 = 3.9 \times 10^{-8} \text{ cm/sec}$

Coefficient of Permeability, $K_{20} = 4.1 \times 10^{-8} \text{ cm/sec}$

Tested in accordance with Method 9100 of Test Methods for evaluation Solid Waste, Third Addition (SW-846) and in general accordance with ASTM D-5084-90.

Lab No. P-95-0018

eviewed By:



Client: EnSafe/Allen & Hoshall

Date of Report: 03/13/95 Project No.: E-2-837

Project Name: NAS Memphis, Tennessee

Sample I.D.: 007S0003117

Soil Description: Dark Brown Clay with Silt & fine

sand lenses running horizontal

	<u> Pre-Test</u>	<u>Post Test</u>
Wet Density (Lbs/ft3)	98.0	103.2
Dry Density (Lbs/ft3)	75.3	73.8
Moisture (% Dry Wt)	30.1	39.9
Porosity (n)	. 544	.554
Degree of Saturation (%)	. 67	.95

Permeability

Temperature Correction, R. = 1.086

 $K_1 = 1.4 \times 10^{-8} \text{ cm/sec}$ $K_2 = 1.4 \times 10^{-8} \text{ cm/sec}$ $K_3 = 1.7 \times 10^{-8} \text{ cm/sec}$ $K_4 = 1.3 \times 10^{-8} \text{ cm/sec}$

Coefficient of Permeability, $K_{20} = 1.6 \times 10^{-8} \text{ cm/sec}$

Tested in accordance with Method 9100 of Test Methods for evaluation Solid Waste, Third Addition (SW-846) and in general accordance with ASTM D-5084-90.

Lab No. P-95-0014

Reviewed By:

bavia b. Meeraj



Client: EnSafe/Allen & Hoshall

Date of Report: 03/17/95

Project No.: E-2-837

Project Name: NAS Memphis, Tennessee

Sample I.D.: 07S0008127

Soil Description: Dark Brown Clay with Silt & fine sand lenses

	<u> Pre-Test</u>	<u>Post Test</u>
Wet Density (Lbs/ft3)	104.9	109.7
Dry Density (Lbs/ft3)	81.1	82.0
Moisture (% Dry Wt)	29.3	33.7
Porosity (n)	.497	.504
Degree of Saturation (%)	.91	1.0

Permeability

Temperature Correction, R, = 1.053

 $K_1 = 8.7 \times 10^{-7} \text{ cm/sec}$ $K_2 = 7.6 \times 10^{-7} \text{ cm/sec}$ $K_3 = 8.4 \times 10^{-7} \text{ cm/sec}$ $K_4 = 8.5 \times 10^{-7} \text{ cm/sec}$

Coefficient of Permeability, $K_{20} = 8.7 \times 10^{-7} \text{ cm/sec}$

Tested in accordance with Method 9100 of Test Methods for evaluation Solid Waste, Third Addition (SW-846) and in general accordance with ASTM D-5084-90.

Lab No. P-95-0017

Reviewed By:

David D. McCray



Client: EnSafe/Allen & Hoshall

Date of Report: 03/13/95

Project No.: E-2-837

Project Name: NAS Memphis, Tennessee

Sample I.D.: 007S000922

Soil Description: Brown Silty Clay

	<u> Pre-Test</u>	<u>Post Test</u>
Wet Density (Lbs/ft3)	119.9	121.1
Dry Density (Lbs/ft3)	94.0	95.4
Moisture (% Dry Wt)	27.5	26.9
Porosity (n)	.430	.420
Degree of Saturation (%)	.963	.980

Permeability

Temperature Correction, R. = 1.056

 $K_1 = 6.9 \times 10^{-7} \text{ cm/sec}$ $K_2 = 1.0 \times 10^{-6} \text{ cm/sec}$ $K_3 = 9.7 \times 10^{-7} \text{ cm/sec}$ $K_4 = 9.2 \times 10^{-7} \text{ cm/sec}$

Coefficient of Permeability, $K_{20} = 9.5 \times 10^{-7} \text{ cm/sec}$

Tested in accordance with Method 9100 of Test Methods for evaluation Solid Waste, Third Addition (SW-846) and in general accordance with ASTM D-5084-90.

Lab No. P-95-0016



Client: EnSafe/Allen & Hoshall

Date of Report: 03/13/95

Project No.: E-2-837

Project Name: NAS Memphis, Tennessee

Sample I.D.: 008MW025

Soil Description: Dark Brown Silty Clay

	<u> Pre-Test</u>	<u>Post Test</u>
Wet Density (Lbs/ft3)	126.0	128.4
Dry Density (Lbs/ft3)	100.1	101.8
Moisture (% Dry Wt)	25.9	26.1
Porosity (n)	.396	.384
Degree of Saturation (%)	1.0	1.0

Permeability

Temperature Correction, R, = 1.086

 $K_1 = 5.9 \times 10^{-7} \text{ cm/sec}$ $K_2 = 1.6 \times 10^{-7} \text{ cm/sec}$ $K_3 = 1.6 \times 10^{-7} \text{ cm/sec}$ $K_4 = 2.0 \times 10^{-7} \text{ cm/sec}$

Coefficient of Permeability, $K_{20} = 3.0 \times 10^{-8} \text{ cm/sec}$

Tested in accordance with Method 9100 of Test Methods for evaluation Solid Waste, Third Addition (SW-846) and in general accordance with ASTM D-5084-90.

Lab No. P-95-0015

Reviewed By:

-755 B - FAX 901-386-6614



Client: EnSafe/Allen & Hoshall

Date of Report: 02/27/95

Project No.: E-2-837

Project Name: NAS Memphis, Tennessee

Sample I.D.: 0600S0003022

Soil Description: Gray Silty Clay

•	Pre-Test	<u>Post Test</u>
Wet Density (Lbs/ft3)	127.1	124.6
Dry Density (Lbs/ft3)	104.9	100.6
Moisture (% Dry Wt)	21.2	23.8
Porosity (n)	.366	.361
Degree of Saturation (%)	.97	.99

Permeability

Temperature Correction, R, = 1.043

 $K_1 = 2.2 \times 10^{-7} \text{ cm/sec}$ $K_2 = 1.0 \times 10^{-7} \text{ cm/sec}$ $K_3 = 1.7 \times 10^{-7} \text{ cm/sec}$ $K_4 = 1.6 \times 10^{-7} \text{ cm/sec}$

Coefficient of Permeability, $K_{20} = 1.7 \times 10^{-7} \text{ cm/sec}$

Tested in accordance with Method 9100 of Test Methods for evaluation Solid Waste, Third Addition (SW-846) and in general accordance with ASTM D-5084-90.

Lab No. P-95-0011



Report of Laboratory Analysis

EnSafe/Allen & Hoshall 5720 Summer Trees Drive, Suite 8 Memphis, Tennessee 38134 Project No.: E-2-837 Date: 13 March '95

Sheet 1 of 1

Project: NAVY CLEAN Memphis, Tennessee			
Sample Identification	007S0003117	008MW025	007S000922
Percent Moisture (as received)	30.1%	25.9%	27.5%
Bulk Density Wet (as received) LBS/ft ³	98.0	126.0	119.9
Bulk Density Dry (as received) LBS/ft ³	75.3	100.1	94.0
Specific Gravity	2.65	2.64	2.64

Reviewed by:

David D. McCray



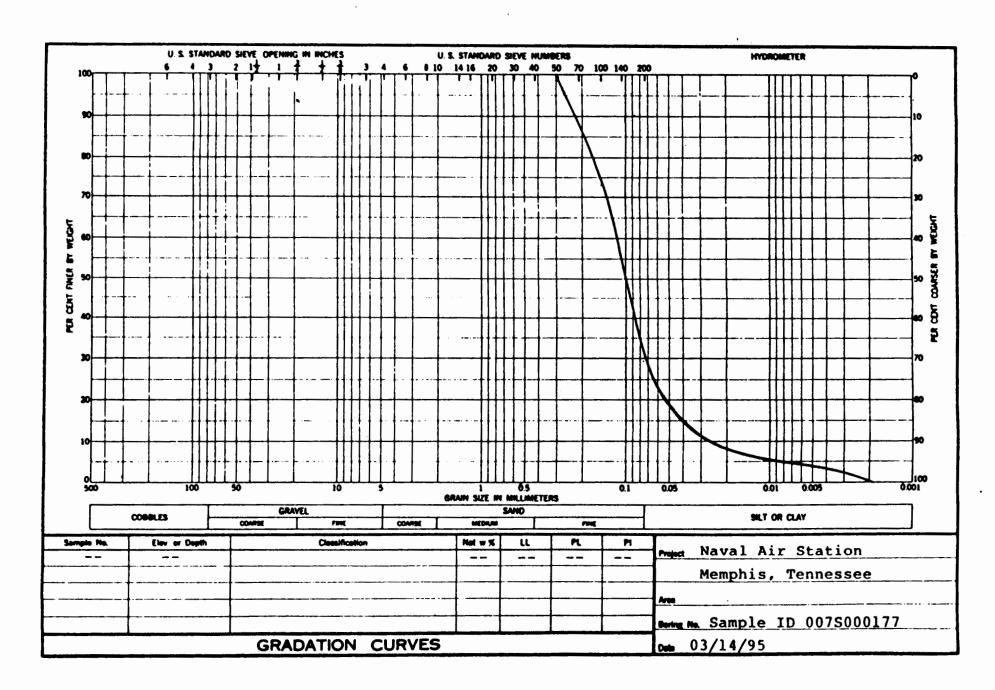
Report of Laboratory Analysis

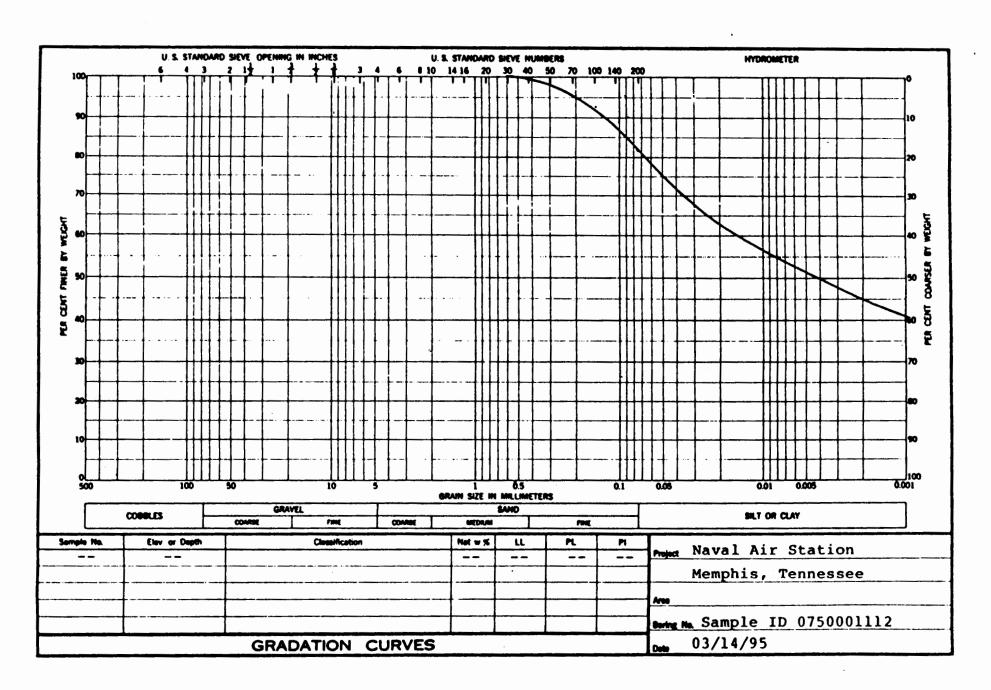
EnSafe/Allen & Hoshall 5720 Summer Trees Drive, Suite 8 Memphis, Tennessee 38134 Project No.: E-2-837 Date: 17 March '95 Sheet 1 of 1

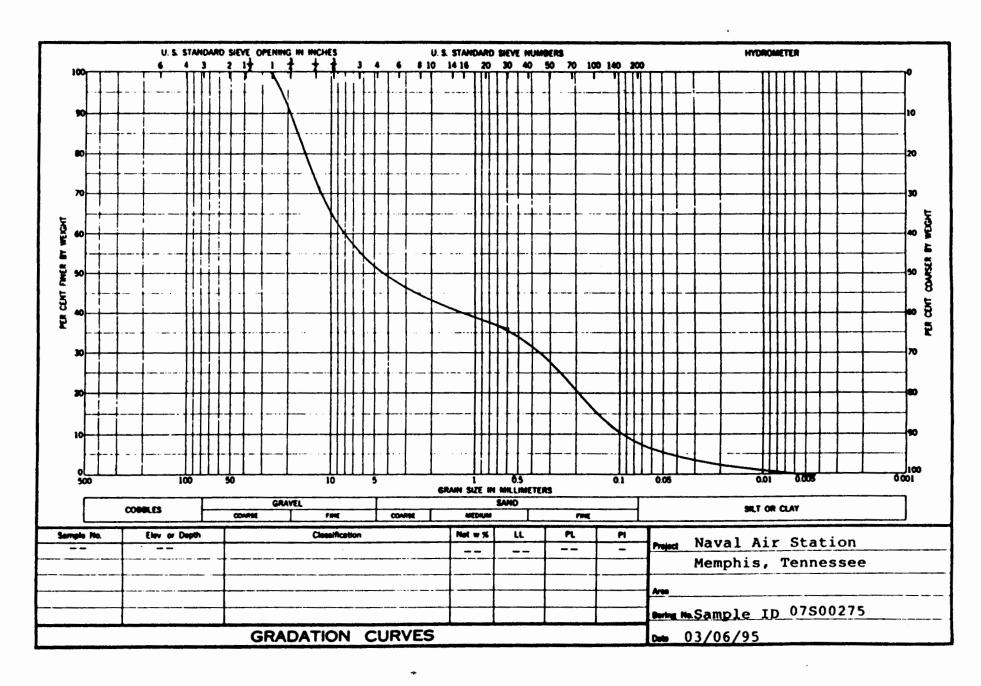
Project: NAVY CLEAN Memphis, Tennessee			
Sample Identification	07S0008127	07S0001112	007S000177
Percent Moisture (as received)	29.3%	31.7%	17.4%
Bulk Density Wet (as received) LBS/ft ³	104.9	105.6	118.6
Bulk Density Dry (as received) LBS/ft ³	81.1	80.2	101.0
Specific Gravity	2.65	2.65	2.63

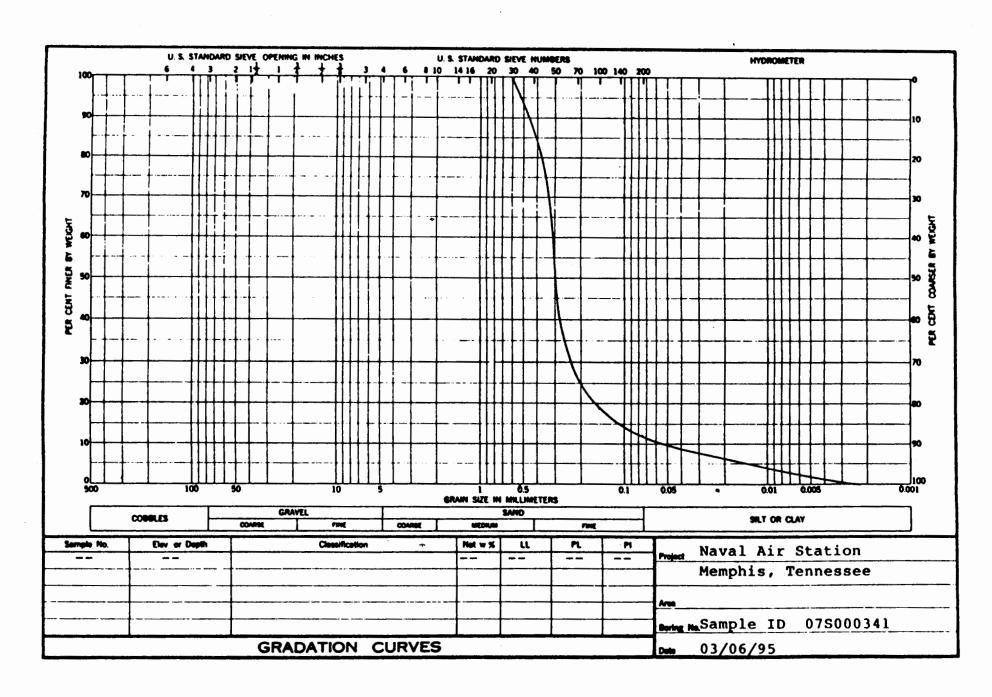
Reviewed by:

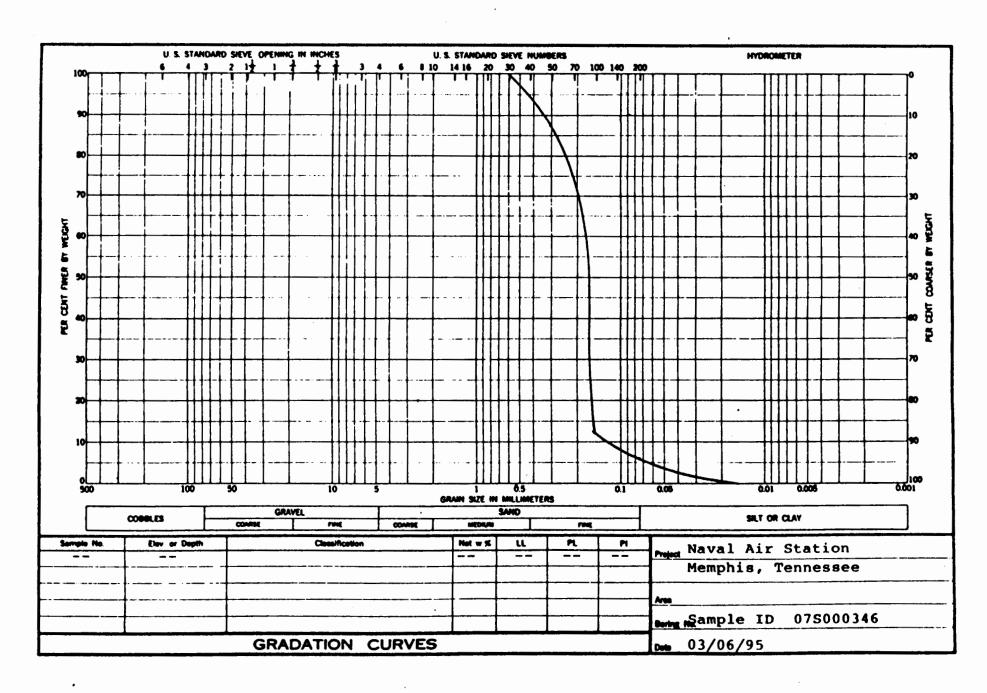
David D. McCray

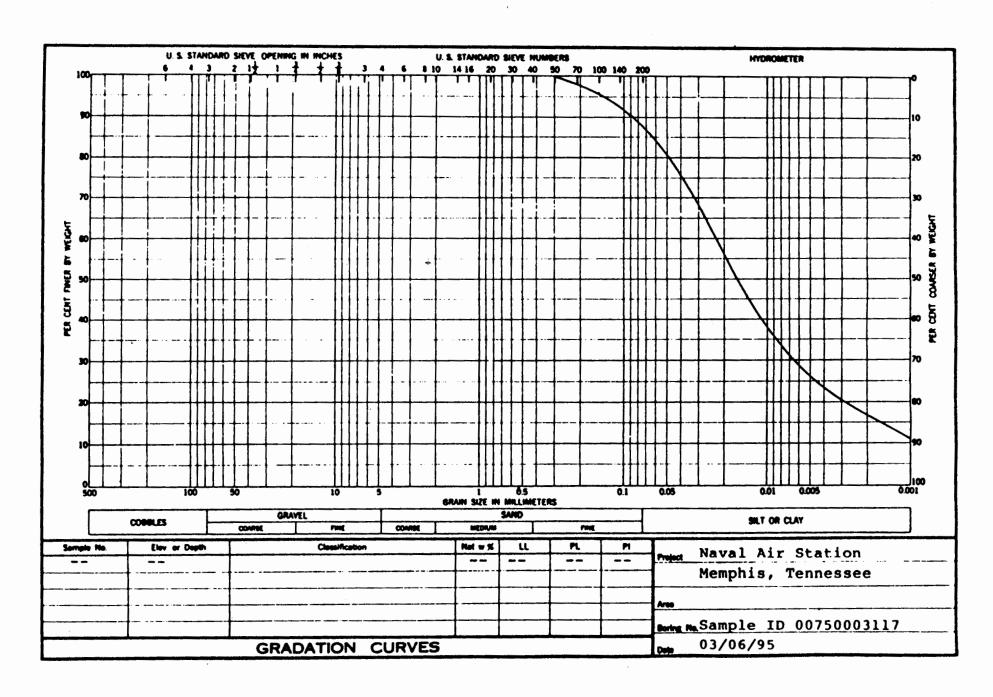


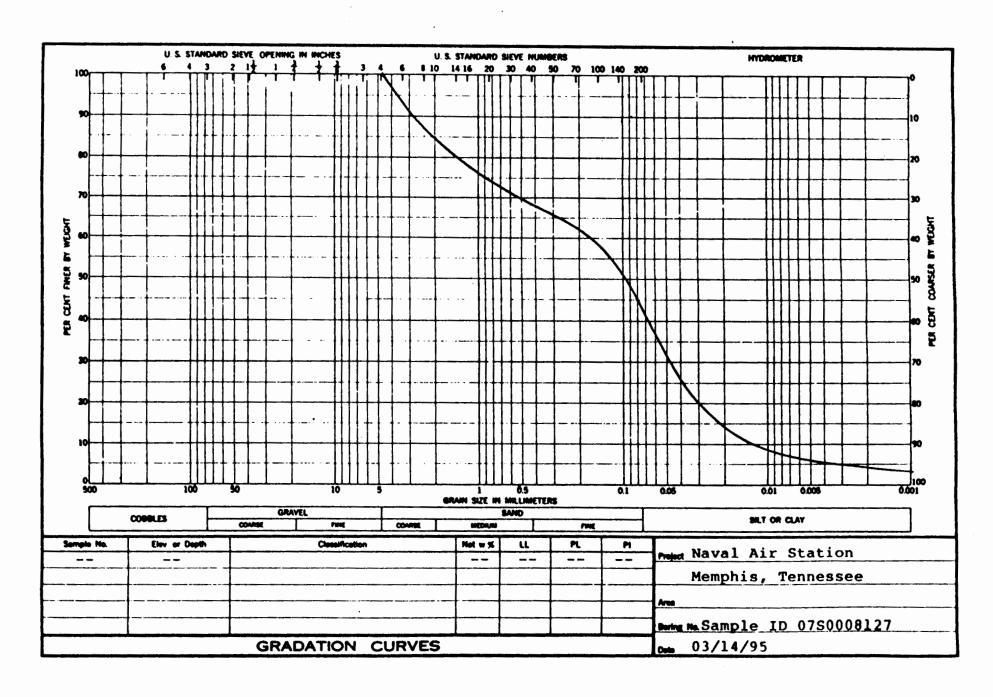


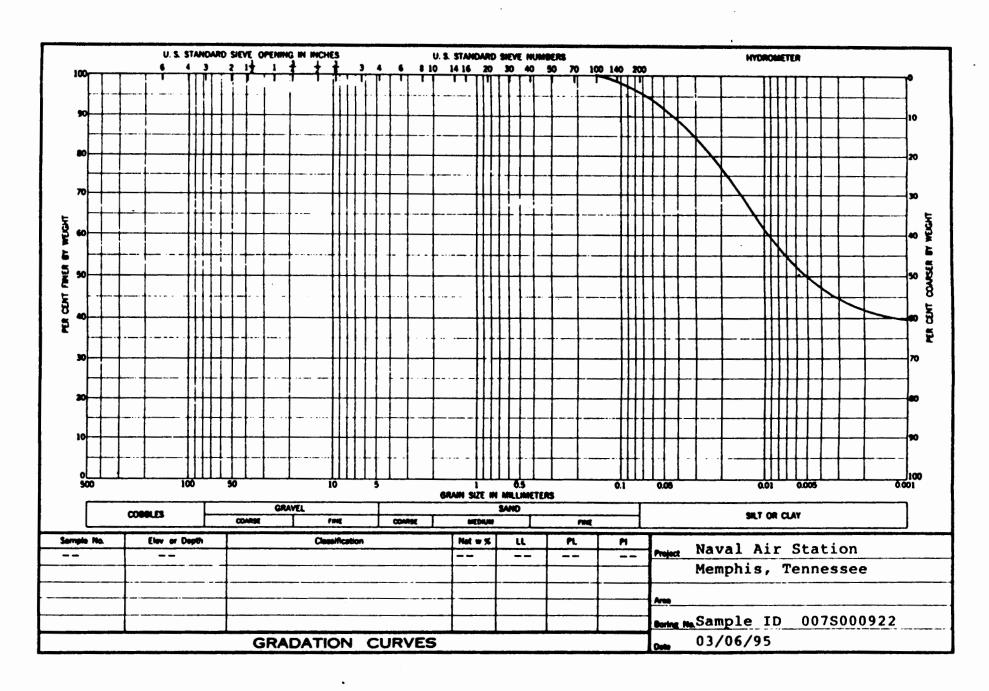


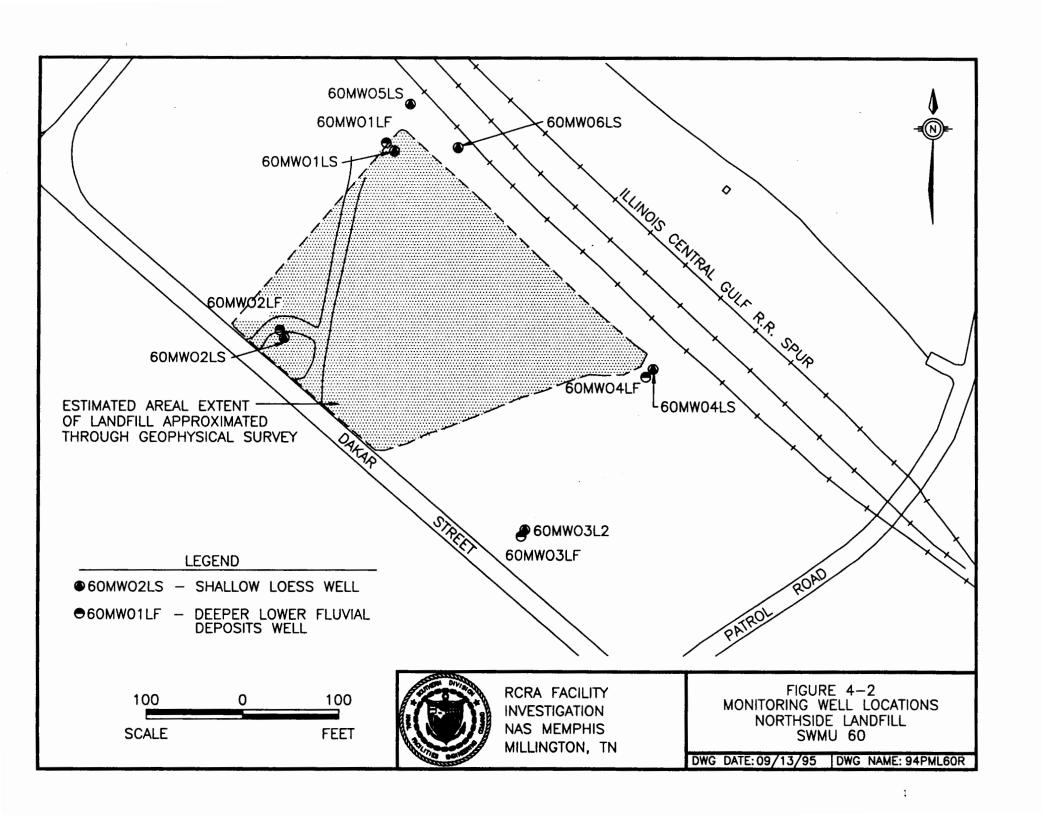












En.	Sai	fe,	/AI	ller) &	Н	oshall	Monitoring	Well	60MW01LS	
Project:	NAS M	emph	is		_	_		Location: Milington, TN. SWMU 60 - North Landfill			
Project N	o: NO	094						Surface Elevation: 269.25 feet			
Started a	t <i>on 1</i>	-31-9	35					TOC Elevation: 271.87 feet ms/		·	
Complete	dat o	n 1–3	1-95	_				Depth to Groundwater: 3.30 fe	<u></u>	Measured: 3/31/95	
Drilling Me	thoa: /	Rotas	sonic	_				Groundwater Elevation: 268.57	feet ms/		
Drilling Co				er Drillir	ng			Total Depth: 20.0 feet			
Geologist:	Ryan	Liste	er	_	 -			Well Screen: 10 to 20 feet			
DEPTH IN FEET LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	* RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLO	OGIC DESCRIPTION	ELEV. (ft-ms)	WELL DIAGRAM	
10	A S	3	80 60 100	313		ML	Silt, dark yellowish brown, has light oliv streaking. Silt, olive gray to m moderate yellowish 15'-20'. Black stair staining present fro	brown silt inclusions from silt inclusions from paired well MW-01-LF.	249.2	Continuity PVC screen PK	
35-											
40-											

EnSafe/Allei	n & Hoshall	Monitoring Well Boring 605	60MW01LF 30001
Project: NAS Memphis		Location: Milington TN. SWMU#60	North Landfill
Project No.: NO094		Surface Elevation: 269.19 feet msl	
Started at 0700 on 1-31-95		TOC Elevation: 271.44 feet ms/	
Completed at 0845 on 2-02-95	5	Depth to Groundwater: 20.49 feet	Measured: 03/31/95
Drilling Method: Rotasonic		Groundwater Elevation: 250.95 feet	msi
Drilling Company: North Star Drilli	ling	Total Depth: 75.0 feet	
Geologist: David Ladd		Well Screen: 65 to 75 feet	
DEPTH IN FEET LITHOLOGIC SAMPLE ANALYTICAL SAMPLE SAMPLE SAMPLE SAMPLE PID (DOM)	GRAPHIC LOG SOIL CLASS	OGIC DESCRIPTION	WELL DIAGRAM
1 80 46 10 2 60 313 3 100 3.4 20 30 30 30 30 30 30 30 30 30 30 30 30 30	Silt, pale olive with and 5'-7'. Silt, dark yellowish brown, has light olistreaking. Silt, olive gray to moderate yellowish 15'-20'. Black staistaining present from the staining present (2) staining present (2). Silt, light olive gray staining present (2). Silt, moderate yellowish 15'-20'. Some but mostly moderate yellowish 15'-20'. Some but mostly moderate yellowish 15'-20'.	orange to moderate yellowish ve gray silt inclusions and iron medium dark gray with brown silt inclusions from ning present at 15'-17'. No om 20'-25'.	

EnSafe/All	en & Hoshall	Monitoring Well (Boring 60S)	SOMWOILF DOO1
Project: NAS Memphis		Location: Milington TN. SWMU#60 No.	rth Landfill
Project No.: NO094		Surface Elevation: 269.19 feet msl	
Started at 0700 on 1-31-95		TOC Elevation: 271.44 feet msl	
Completed at <i>0845</i> on 2-02	P-95	Depth to Groundwater: 20.49 feet	Measured: 03/31/95
Drilling Method: Rotasonic		Groundwater Elevation: 250.95 feet ms	
Drilling Company: North Star	Driting	Total Depth: 75.0 feet	
Geologist: David Ladd	3	Well Screen: 65 to 75 feet	
DEPTH IN FEET LITHOLOSIC SAMPLE ANALYTICAL SAMPLE SAMPLE SAMPLE NO.	GRAPH GRAPH SOIL C	OGIC DESCRIPTION	WELL DIAGRAM
45- 50- 60- 70- 75- 80-	Sand, fine to coars dark yellowish oran gravel. Sand and gravel, pyellowish gray to dis chert and quartz Gravel and sand, of moderate brown, check the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of the coars of	oorly sorted and silty, lark yellowish orange. Gravel with chert gavels up to 2.5". see grained, yellowish gray to age, contains some scattered oorly sorted and silty, ark yellowish orange. Gravel chert and quartz gravel up to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish orange to ark yellowish yellowish orange to ark yellowish yellowish yellowish yellowish yellowish yellowish yellowish yellowish yellowish yellowish yellowish yellowish yellowish yellowish yellowish yellowish yellowish yellowish yellowish yellowish yellowish yellowish yellowish yellowish yellowish yellowish yellowish yellowish yellowish y	+— 0.01 slot, PVC screen -> - 2" ID, Sch. 40 PVC and 8" steel casing

EnSafe/A	Allen & I	Hoshall	Monitoring W	ell 6	OMWO2LS	
Project: NAS Memohis			Location: Milington, TN. SWMU#60 - North Landfill			
Project No.: NOO94			Surface Elevation: 268.85 feet /			
Started at 0830 on 2-0	1–95		TOC Elevation: 270.84 feet ms/			
Completed at 1015 on 2-6	OI95		Depth to Groundwater: 3.860 fe	et	Measured: 3/31/95	
Drilling Method: Rotasoni			Groundwater Elevation: 266.98 1			
Drilling Company: North S	Star Drilling		Total Depth: 20.0 feet			
Geologist: Ryan Lister			Well Screen: 10 to 20 feet			
DEPTH IN FEET LITHOLOGIC SAMPLE ANALYTICAL SAMPLE SAMPLE SAMPLE	* RECOVERY PID (ppm) GRAPHIC LOG	SOIL CLASS	GIC DESCRIPTION	ELEV. (fl-ms)	WELL DIAGRAM	
5	O BG	Silt, moserate yellor Roots occuring at .! at 1' stained black. ML Silt, moderate yellor gray to light olive g Staining also at 9.5' Silt, olive gray with of an inch. End of boring. Total Analytical and geological siles are yellor gray with a staining also at 9.5'	wish brown with organics. 5' and 4'. 1" gravel section wish brown, with a greenish ray silt swirled throughout. iron nodules to one quarter all depth of boring at 20'. regic description taken from the acceptance of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the sec	- - 248.9	——————————————————————————————————————	

EnSafe/	Allen	& Ho	oshall	Monitoring W Boring 6	ell 6 050	OMW02LF 002
Project: NAS Memphis	·			Location: Millington TN. SWMU	#60 - N	orth Landfill
Project No.: NO094	 -	•,		Surface Elevation: 268.43 feet		
Started at 1120 on 2-01	-95			TOC Elevation: 270.90 feet ms/	-	
Completed at on 2-02-	-95			Depth to Groundwater: 20.00 fe	et	Measured: 3/31/95
Drilling Method: Rotason	nic			Groundwater Elevation: 250.90	_	
Drilling Company: North	Star Drilling		·	Total Depth: 95.0 feet		
Geologist: Jack C.		*		Well Screen: 83 to 93 feet		
DEPTH IN FEET LITHOLOGIC SAWPLE ANALYTICAL SAMPLE SAMPLE SAMPLE	X RECOVERY PID (ppm)	GRAPHIC LOG SOIL CLASS	GEOLO	OGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
5 1 10 2 15 3 1	70 BG 90 BG	ML GP/	Silt, moderate yello gray to light olive gray with of an inch. Silt, olive gray with of an inch. Silt, olive gray to me present 25'-30'. Silt, dark yellowish of to light gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith gray silt swith g	edium light gray, iron nodules	-228.4	

EnSafe,	/All	len	&	Нс	shall	Monitoring W Boring 6	ell 6 050	OMW02LF 002
Project: NAS Memph	is					Location: Millington TN. SWMU:	#60 - N	orth Landfill
Project No.: NO094						Surface Elevation: 268.43 feet		
Started at 1120 on 2-	-01-95					TOC Elevation: 270.90 feet ms/		
Completed at on 2-	72-95					Depth to Groundwater: 20.00 fe	et -	Measured: 3/31/95
Drilling Method: Rota	sonic					Groundwater Elevation: 250.90		
Drilling Company: Noi		Drittine	7			Total Depth: 95.0 feet		
Geologist: Jack C.						Well Screen: 83 to 93 feet		
DEPTH IN FEET LITHOLOGIC SAMPLE ANALYTICAL SAMPLE SAMPLE	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS		OGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
45 5 6 6 7 7 75 8	93	BG BG	00000000000000000000000000000000000000	GP GP	brown. Chert and diameter. Sand and gravel, y brown, stained yells is fine to very coal Sand with some gravery coarse graine Sand and gravel, y brown, locally stain is chert and quartz grained. Sand with some grafine to coarse grain.	relatively clean, yellowish quartz gravels up to 2.5" in ellowish gray to yellowish owish orange near 49'. Sand rise grained, silty. avel, yellowish gray, fine to d, relatively clean. ellowish gray to yellowish ed yellowish orange. Gravel, sand is fine to very coarse avel, dark yellowish orange, med.	228.4	**************************************

	Ens	Sa	fe,	/AI	ler	&	Н	oshall	Monitoring Boring	well 6 60500	0MW02LF 002	
Pro	ject: /	NAS M	lemph	is					Location: Milington TN. SWMU#60 - North Landfill			
	ject N								Surface Elevation: 268.43 fee	et msl		
	arted a								TOC Elevation: 270.90 feet m	s/		
1	nplete								Depth to Groundwater: 20.00		Measured: 3/31/95	
	ing Me								Groundwater Elevation: 250.9	O feet msl		
	ing Co			th Sta	r Drillir	g			Total Depth: 95.0 feet			
Geo	ologist:	Jack	· <u>Γ</u>		1	1	Т.	·	Well Screen: 83 to 93 feet			
DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	* RECOVERY	PID (ppm)		SOIL CLASS	GEOLG	GIC DESCRIPTION	ELEV. (ft-msl)	METT DIABLE Seal	
85- 90-			9	90	BG		GP	Sand coarse with g yellowish orange.	ravel, grayish brown to dark	175.4	0.01 slot, PVC screen	
95-			10	100	BG		ML	micaceous, dry.	brown, laminated, stiff, finely	73.4		
								bottom of well will b				
100-												
105-												
110-												
115-												
120-											·	

Eı	nSa	fe,	/AI	len	&	Н	oshall	Monitoring	Well 6	OMWO3LS
Project	: NAS A	lетрh	is		-			Location: Milington, TN. SWMUH60 - North Landfill		
	No.: NO							Surface Elevation: 269.60 f		
	at on.							TOC Elevation: 271.40 feet i	ns/	
	ted at a						-	Depth to Groundwater: 7.03		Measured: 3/31/95
	dethod:							Groundwater Elevation: 264.	37 feet ms/	·
	Company st: <i>Rya</i> /			r Urwn	<u>g</u>			Total Depth: 20.0 feet		·
0000	Ji. Hya	T	<u></u>	T	T	T .		Well Screen: 10 to 20 feet		
DEPTH IN FEET LITHOLOGIC	SAMPLE ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PIO (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLC	OGIC DESCRIPTION	ELEV. (ft-ms)	WELL DIAGRAM
10 15 20 35 40		3	100	BG BG		ML	Silt, greenish gray to	ng terminated at 40'.	249.6	—————————————————————————————————————

Er	nSa	fe/	/AI	len	&	Нс	shall	Monitoring W Boring 60	ell 6 050	OMWO3LF OO3
Project	: NAS M	lemphi.	5					Location: Millington TN. SWMU#	#60 - N	orth Landfill
Project	No.: NO	0094						Surface Elevation: 268.90 feet i		
	at 1330							TOC Elevation: 271.52 feet msl		
	ted at 16			-95				Depth to Groundwater: 20.02 fe	et	Measured: 3/31/95
	Method		_					Groundwater Elevation: 251.50 fe	eet ms/	
	Company			r Drilling	7			Total Depth: 95.0 feet		
Geologis	st: <i>Jack</i>	Carm	icnaei	T	·			Well Screen: 77 to 87 feet	Τ_	· · · · · · · · · · · · · · · · · · ·
DEPTH IN FEET LITHOLOGIC	SAMPLE ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLG	OGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
10	7S	1 2 5	100	BG BG BG	9	ML	Silt, moderate yello very dry. Silt, greenish gray Silt, clayey, greenis			
35-		7		BG BG			gray silt swirling.	sh gray, iron staining and light orange with a light olive gray irled througout.		
40		8	93	BG		(GM/	Silt, light olive gray		-228.9	

	Ens	Sat	e/	/AI	len	&	Нс	shall	Monitoring (Boring 6	Well 6	0MW03LF 003	
Pro	ject: Ā	IAS ME	emphi:	5			_	<u> </u>	Location: Millington TN. SWMU#60 - North Landfill			
Pro	ject No): NO	094						Surface Elevation: 268.90 fee			
Sta	rted at	1330	on 2-	-01-95	5				TOC Elevation: 271.52 feet ms	1		
Cor	npleted	at 163	30 on	2-07	- <i>9</i> 5				Depth to Groundwater: 20.02		Measured: 3/31/95	
Drift	ing Met	hoct f	Rotas	onic					Groundwater Elevation: 25150	feet msi		
Drif	ing Corr	pany:	Nort	th Sta	r Drillin	g			Total Depth: 95.0 feet			
Geo	ologist:	Jack	Carmi	chael					Well Screen: 77 to 87 feet			
DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	* RECOVERY	PIO (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLG	OGIC DESCRIPTION	SELEV. (ft-ms)	WELL DIAGRAM	
45-			9	70	BG	00-00-00-00-00-00-00-00-00-00-00-00-00-		some intervals of r half of an inch, dan orange, wet. Silt, clayey, pale y 49'-55' there are gravel which are pi	ith gravel, silty, trace clay, eal clean gravel up to one rk yellwoish orange to grayish ellowish brown, moist, from alternating layers of sandy nkish gray to dark yellowish a super saturated interval from	2209		
55- 60-			11	100	BG BG	9-9-9-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0	GM	Sand, fine to coars dark yellowish oran	se with gravel, very pale to ige, wet.		40 PVC and 8" steel casing	
65-			13	100	BG	2-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0			e, trace silt, gravelly, gravel nd number between 70'–75'. ish orange, wet.		7" 10, Sch.	
75-			15	95	BG BG	0 0 0 0 0 0 0 0	SP	Same as above exc less gravel.	ept a much cleaner sand,	193.9	10/20 sand >+- A >+	

EnSafe/A	llen & Ho	Monitoring Well 60MW03LF Boring 60S0003
Project: NAS Memphis		Location: Milington TN. SWMU#60 - North Landfill
Project No.: NOO94		Surface Elevation: 268.90 feet ms/
Started at 1330 on 2-01-9		TOC Elevation: 27152 feet msl
Completed at 1630 on 2-07	<i>-95</i> 	Depth to Groundwater: 20.02 feet Measured: 3/31/95
Driting Method: Rotasonic		Groundwater Elevation: 25150 feet msl
Drilling Company: North Sta		Total Depth: 95.0 feet
Geologist: Jack Carmichael	1 1 1	Well Screen: 77 to 87 feet
DEPTH IN FEET LITHOLOGIC SAMPLE ANALYTICAL SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE SAMPLE S	PIO (ppm) GRAPHIC LOG SOIL CLASS	GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION GEOLOGIC DESCRIPTION
90- 18 110 110 110 115- 115- 115- 115- 115- 11	BG CL BG	Silt, clayey, grayish brown, stiff, mottled with laminations towards the end of the run. Silt, clayey, grayish brown, stiff, mottled with laminations towards the end of the run. Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt Silt S

EnS	afe,	/AI	len	&	Нс	shall	Monitoring W Boring 6	ell 6 050	OMW04LF 004
Project: NAS	: Memph	is					Location: Memphis, TN		
Project No.:							Surface Elevation: 269.67 feet ms/		
Started at 0	915 on 1-	-31-95					TOC Elevation: 272.20 feet ms/		
Completed at	1215 an	2-08-	-95				Depth to Groundwater: 20.70 fe	æt	Measured: 3/31/95
Drilling Metho	i Rota	sonic					Groundwater Elevation: 25161 fe	-	0,0,00
Dritting Compa	ny: Nor	th Sta	r Drilling	7			Total Depth: 96.0 feet		····
Geologist: Ja	ck Carm	ichael	•				Well Screen: 86 to 96 feet	_	,,, <u> </u>
DEPTH IN FEET LITHOLOGIC SAMPLE ANALYTICAL	SAMPLE SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLO	OGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
10	2	80	BG BG		ML	very dry. Silt, moderate yello organics. Wet from 9'-10', moist.	wish brown with organics, wish brown with fewer 5'-9', but becomes wet at ay, moist down to 20.5 then e iron staining at 27'.		2" ID, Sch. 40 PVC and 8" steel casing ————————————————————————————————————
35-	5	90	2.9 60.2			Silt, moderate yellow moist.	vish brown dry to slightly		The Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Same of the Sa

	Ens	Sai	fe,	/AI	llen	&	Нс	oshall	Monitoring Well 60MW04LF Boring 60S0004				
Pro	ject: ^	VAS M	emph	is					Location: Memphis, TN				
Pro	ject No	or WO	094						Surface Elevation: 269.67 feet msl				
	rted at								TOC Elevation: 27220 feet ms	/			
Con	npleted	at 121	5 an	2-08	-95				Depth to Groundwater: 20.70 f	feet	Measured: 3/31/95		
	ing Met								Groundwater Elevation: 25161 feet msl				
	ing Corr					g	_		Total Depth: 96.0 feet				
Geo	ologist:	Jack	Carm	ichael	<u>'</u>	1- 1			Well Screen: 86 to 96 feet				
DEPTH IN FEET	GIC CAL CAL LOG					GRAPHIC LOG	SOIL CLASS	GEOLG	OGIC DESCRIPTION	ELEV. (ft-ms)	WELL DIAGRAM		
55-			9 10	90	BG BG	20-00-00-00-00-00-00-00-00-00-00-00-00-0	ML	51.5'-52'. Grayish I orange, wet.	with clayey gravel seam at brown to dark yellowish silty. Color change from ish green, then becoming ge at 58'-65', wet.	224.7	2" ID, Sch. 40 PVC and 8" steel casing ————————————————————————————————————		
70-			13	95	BG BG	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		change to yellowish	crease and color starting to orange.		munimummummmmmmmmmmmmmmmmmmmmmmmmmmmmmm		
80			9	100	BG		_	grayish orange.	- C C C				

	Ens	Sai	fe	/All	len	&	Н	oshall	Monitoring Well 60MW04LF Boring 60S0004				
Pro	ject: Λ	IAS M	этрі:	5					Location: Memphis, TN				
Pro	ject No	: NO	094						Surface Elevation: 269.67 feet msl				
	rted at								TOC Elevation: 272.20 feet msl				
Con	npleted	at 12	15 an .	2-08-	95				Depth to Groundwater: 20.70 feet Measured: 3/31/95				
Drit	ng Metl	hod:	Rotas	onic					Groundwater Elevation: 251.61 feet msl				
Driff	ing Com	pany:	Non	th Star	Drillin,	g			Total Depth: 96.0 feet				
Ged	ologist:	Jack	Carm	chael					Well Screen: 86 to 96 feet				
DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS		MELL DIAGRAM				
90- 100- 115-			10	87.5	BG	1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	GM	diameter towards t yellowish orange and Gravel, sandy, silty Cobbles up to 3" in orange, wet.	with small amounts of clay. diameter, very dark yellowish dish brown stained, lower le brown, moist.				

	En	Sa	fe	/Ai	ller	7 6	3 Н	'oshall	Monitoring Well 60MW05LS Boring 60S0005				
Pro	ject:	NAS I	vlempt	y's					Location: Milington, TN. SWMU#60 - North Landfill				
	ject N								Surface Elevation: 269.75 feet msl				
—				2-13-					TOC Elevation: 27188 feet msl				
Con	nplete	d at (900	on 2-1	3- <i>9</i> 5				Depth to Groundwater: 4.09 fe	et	Measured: 3/31/95		
	ing Me								Groundwater Elevation: 267.89	feet ms/			
				rth Sta	ar Drilli	ng_			Total Depth: 20.0 feet				
Geo	plogist	: Jac	Υ C.			_	-	<u> </u>	Well Screen: 10 to 20 feet				
DEPTH IN FEET	LITHOLOGIC	ANALYTICAL	SAMPLE NO.	* RECOVERY	PID (ppm)	GRAPHICIOS	SOUTH OF ASS	GEOL(OGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM		
	Λ.	1						Fill, dark brown silt	with scattered gravel.				
5-	Silt, clayey, soft ligorange, mottled, da finely laminated. Silt, clay, greenish							orange, mottled, da finely laminated. Silt, clay, greenish	ght olive gray to grayish ark brown inclusions, moist, gray, mottled dark yellowish		**************************************		
10-	orange, laminate Silt, clay, grayis orange, laminate moist. 80 BG ML Silt, clayey, pale						ML	Silt, clay, grayish orange, laminated with moist.	clay, greenish gray, mottled dark yellowish ge, laminated, soft, moist. clay, grayish orange mottled yellowish ge, laminated with dark inclusions, soft,				
15-								Silt, clayey, pale yo stained yellowish o	rellowish brown, becoming orange from 18'-19'.				
20			4	80	BG			Silt, clayey, medium	gray, massive, moist.	249.7			
25-								BG = Background (1.1 ppm)				
30-													
35-													
40-													

EnSafe/Allen & Hoshall										Monitoring Well 60MW06LS Boring 60S0006			
Pro	ject: /	VAS M	emph	is						Location: Milington, TN. SWMU#60 - North Landfill			
	ject No									Surface Elevation: 269.58 feet	ms/		
Sta	rted a	t <i>1020</i>	on 2	-13-9:	5					TOC Elevation: 271.98 feet msl		·- · · · · · · · · · · · · · · · · · ·	
Con	npletec	1 at 10	50 or	1 <i>2–13</i> -	-9 5					Depth to Groundwater: 3.37 fee	t	Measured: 3/31/95	
Dritti	ing Met	hod	Rotas	sonic						Groundwater Elevation: 268.58	feet msl		
Dritt	ng Con	npany	Nor	th Sta	r Drillir	g				Total Depth: 20.0 feet			
Geo	ologist:	Jack	Carm	ichael			_			Well Screen: 10 to 20 feet			
DEPTH IN FEET	GICAL ICAL ICAL ICAL ICAL ICAL ICAL ICAL							SOIL CLASS	GEOL	OGIC DESCRIPTION WELL DIAGRAM			
ì	Λ								Fill, dark brown silt	with scattered gravel.	_		
5-			1	40	BG				No sample descript	ion; poor recovery.		2" ID, Sch. 40 PVC ***********************************	
									orange, mottled bro	yellowish brown, laminated		2" ID, Sct	
10-			2	133	BG			ML	yellowish orange fr	, becoming stained dark om 12.5'-13'.		0.01 slot, PVC screen ———————————————————————————————————	
15-							1	ate yellowish brown mottled s, finely laminated, soft.					
	X								Silt, clayey, medium	gray, moist, soft.		0.01 sk	
20-			4	100	BG						249.6		
25-									BG = Background (1.1 ppm)			
30-													
35-										·			
40-													

	Ens	Sa	fe,	/Al	len	&	Н	oshall	Monitoring Well 60MW04LS				
Pro	ject: /	VAS M	lemoh	is					Location: Milington, TN. SWMU#60 - North Landfill				
	ject No								Surface Elevation: 269.57 fee				
	rted a			-31-95	,				TOC Elevation: 27211 feet ms/				
Con	npletec	at 12	15 o n	1-31-9	35				Depth to Groundwater: 4.95 fe	et	Measured: 3/31/95		
Drin	ing Met	hod	Rota	sonic					Groundwater Elevation: 267.16	feet ms/			
Orilli	ing Con	npany	: Nor	th Sta	r Drillin	g			Total Depth: 20.0 feet				
Geo	ologist:	Ryar	Liste	er					Well Screen: 10 to 20 feet				
DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLO	OGIC DESCRIPTION	WELL DIAGRAM			
5- 10- 20- 35-	NI SW	AN AN AN AN AN AN AN AN AN AN AN AN AN A	1 2 3 4	80	BG BG 80.1	GR	ML	Silt, moderate yello organics. Wet from 9'-10'. Silt, medium light gradecoming dry. Som	ay, moist down to 20.5 then e iron staining at 27'. C'. Geologic description and are taken from paired well	249.6	← 0.01 slot, PVC screen → 2" ID, Sch. 40 PVC — 11111111111111111111111111111111111		

Attachment 3 Dieldrin Technical Memorandum

DISCUSSION OF DIELDRIN RISK MANAGEMENT ISSUES

Chlorinated pesticides (specifically dieldrin) were used extensively in the 1950s and 1960s during a white fringed beetle quarantine. NAS Memphis has record that the agents were applied aerially for their intended purpose over the majority of the base. During the RCRA Facility Investigation, dieldrin and other chlorinated pesticides were detected in most surface soil and some vadose soil samples collected at specific SWMUs and background locations. Due to the ubiquitous presence of dieldrin in site soils, the following assessment was performed to support risk management decisions to be made by the BCT.

Figure 1 shows reported surface (0-1 ft.) soil dieldrin concentrations across the northern portion of the base. As shown in the figure, levels at SWMUs ranged from below quantitation limits to 609 μ g/kg (average of duplicate results at SWMU 5, boring 4). At background locations, concentrations ranged from below quantitation limits to 311 μ g/kg with a mean of 131 μ g/kg.

In order to provide an evaluation of the significance of the reported levels, standard risk assessment methods were employed. Default assumptions for residential and occupational exposure scenarios were used to project dieldrin-related carcinogenic risk through incidental ingestion and dermal contact soil pathways. For each exposure scenario, risk was computed using the maximum and mean SWMU-specific dieldrin concentrations. The results of this process are provided in the attached table.

As shown in the table, SWMU 5 had the highest projected soil pathway risk associated with dieldrin at maximum concentrations (2.2E-5). The SWMU 5 risk estimate was approximately twice that of the corresponding background. When mean concentrations were used as the exposure point concentration, SWMU 8 dieldrin risk was found to be the highest although it did not differ appreciably from background. In no instance (onsite or background) did dieldrin risk projections exceed 1E-4. This finding indicates that dieldrin levels found at each SWMU do not necessitate remedial action in the absence of other significant carcinogenic risk contributors. USEPA's generally acceptable range for carcinogenic risk is 1E-4 to 1E-6.

Soil dieldrin is not expected to pose a substantial threat to shallow groundwater at any SWMU or background location. This conclusion is based on the strong soil binding properties of the compound as well as empirical data for vadose soils which show no significant vertical migration has occurred.

A historical use discussion is also helpful to provide a frame of reference for evaluating reported soil dieldrin (and other chlorinated pesticide) concentrations. Information provided by NAS Memphis states that chlorinated pesticides (primarily chlordane) were previously used until the late 1980's for termite control around buildings. Although chlordane was used as a single active ingredient application, mixtures including dieldrin, aldrin and heptachlor

were also common in the pest control trade. Standard application rates resulted in soil concentrations of 500 to 1,000 mg/kg total chlorinated pesticides (or 500,000 μ g/kg to 1,000,000 μ g/kg). For comparison, a 10:1 chlordane:dieldrin mixture used for general subterranean termite control would have resulted in residual soil dieldrin concentration of 50 to 100 mg/kg. These residual application levels are 50 to 100 times higher than the maximum soil dieldrin concentration reported in the RFI.

It should be mentioned that Aroclor-1260 (a polychlorinated biphenyl or PCB) was detected in four soil samples collected at SWMU 5 and one sample from SWMU 7. In each instance, dieldrin was also detected although no strong concentration correlation was observed. Concentrations at SWMU 5 ranged from non-detect to 223 μ g/kg. The single hit reported at SWMU 7 was 20,000 μ g/kg in the boring 7 surface soil sample. Boring 7 at SWMU 7 is actually closer to Building N-16. As a result, the RFI workplan for N-16 should include provisions for further delineating the soil PCB contamination.

This memo was intended to provide a risk-based framework for decision making regarding how the dieldrin issue is resolved. Although standard risk assessment techniques were applied, final resolution of this issue will require a consensus risk management decision. Of paramount importance is the determination of what level of risk is acceptable in light of the extent of the dieldrin. EnSafe/Allen & Hoshall as the contractor can only provide the facts and suggestions for a viable risk management strategy. The following paragraph outlines suggestions based on currently available information and the preceding risk evaluation.

Due to the ubiquitous presence and documented proper historical use, institutional controls are considered the most appropriate means of dealing with the dieldrin issue from a human health perspective. These controls may include (but are not limited to) public/worker awareness, access restrictions and maintenance of adequate vegetative cover to minimize contact. The focus of future investigative efforts should center around prevention of further migration (i.e. surface runoff) and evaluation of sensitive ecological receptor points (i.e. terrestrial habitats, drainage systems, streams, lakes and pond). These areas should be emphasized as little control can be exercised over the animals who use them.

NAS-Memphis Dieldrin Risk Projections

Location	Maximum Dieldrin (mg/kg)	Mean Dieldrin (mg/kg)	Residentia @ Max	@Mean	Industrial @ Max	@Mean
SWMU 1	0.192	NA	7.04E-06	NA	1.12E-06	NA
SWMU 3	0.023	0.0072	8.43E-07	2.64E-07	1.34E-07	4.19E-08
SWMU 5	0.609	0.126	2.23E-05	4.62E-06	3.54E-06	7.33E-07
SWMU 7	0.055	0.0095	2.02E-06	3.48E-07	3.2E-07	5.52E-08
SWMU 8	0.471	0.144	1.73E-05	5.28E-06	2.74E-06	8.37E-07
SWMU 60	0.069	0.0155	2.53E-06	5.68E-07	4.01E-07	9.01E-08
Background	0.311	0.131	1.14E-05	4.8E-06	1.81E-06	7.62E-07

Oral Slope Factor

(mg/kg-d)-1

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